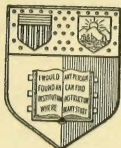


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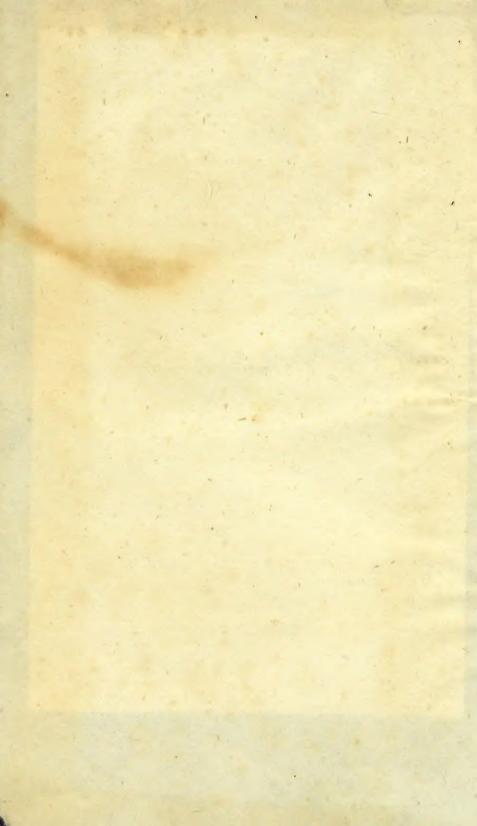
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THE
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SPHINGES, AND MOTHS.

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THE BOOK OF BUTTERFLIES. VOL. I.



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Shalt have the air at freedom for a little
Follow and do me service SHAKESPEARE

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1834.

THE
BOOK OF BUTTERFLIES,
SPHINGES, AND MOTHS;

ILLUSTRATED BY

ONE HUNDRED AND FORTY-FOUR
ENGRAVINGS,

COLOURED AFTER NATURE.

BY

CAPTAIN THOMAS BROWN,

FELLOW OF THE LINNÆAN SOCIETY, MEMBER OF THE WERNERIAN,
KIRWANIAN, AND PHRENOLOGICAL SOCIETIES, AND
PRESIDENT OF THE ROYAL PHYSICAL SOCIETY.

Second Edition.

IN THREE VOLUMES.

VOL. I.

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TO THE HONOURABLE
MRS COLONEL OGILVY OF CLOVA,

THE FOLLOWING PAGES
ARE DEDICATED AS A MARK OF RESPECT,

BY HER
OBEDIENT HUMBLE SERVANT,
THOS. BROWN.

EDINBURGH, *July* 1832.

CONTENTS.

Chap.	Page
PREFACE TO THE SECOND EDITION,	xi
PREFACE,	• xi
INTRODUCTION,	xxiii
I. On the Physiology of the Eggs of Papilionaceous	
Insects,	41
II. Of the Larva or Caterpillar State,	62
III. Of the Pupa, or Chrysalis State,	69
IV. Of the Senses of Lepidopterous Insects,	73
Of Touch,	ib.
Of Taste,	76
Of Smell,	81
Of Hearing,	89
Of Vision,	ib.
Pairing of Lepidopterous Insects,	92
V. Associations and Migrations of Lepidopterous	
Insects,	100
VI. Indirect Injuries to Mankind from Butterflies,	107
VII. Means of Defence of Butterflies,	109
VIII. Of Malformations of Butterflies,	111
IX. Classification of Lepidopterous Insects,	113

	Page
Genus <i>PAPILIO</i> , of Linnæus,	118
The Peacock Butterfly,	120
The Nettle Tortoise-shell Butterfly,	131
The Oriental Emperor.	134
The Hector Trojan,	135
The Amphrysus Butterfly,	136
The Cramerian Butterfly,	137
The Galanthus Butterfly,	138
The Amphinome Butterfly,	139
The Atys Butterfly,	140
The Marsyas Butterfly,	141
The Imperial Trojan,	142
The Æneas Butterfly,	144
The Anchises Butterfly,	145
The Andromachus Butterfly,	147
The Orange-tip Butterfly,	148
The Adonis Butterfly,	150
The Great Copper Butterfly,	151
The Clouded Yellow Butterfly,	152
The Silver Blue Butterfly,	154
The Emperor of the Woods,	156
The Plantain Fritillary,	159
The Archippus Butterfly,	160
The Peranthus Butterfly,	161
The Swallow-tail Butterfly,	162
The Camberwell Beauty,	164
The Brimstone Butterfly,	167

	Page
The Mazarine-Blue Butterfly,	168
The Bolina Butterfly,	169
The Brown Hair-Streak Butterfly,	170
The Cassia Butterfly,	172
The Deiphobus Butterfly,	174
The Chalk-hill Blue Butterfly,	175
The Phorcas Butterfly,	176
The Marbled Butterfly,	177
The Purple Hair-Streak Butterfly,	179
The Black and Gold Butterfly,	180
The Cærulean Butterfly,	181
The Apollo Butterfly,	182
The Forked Butterfly,	184
The Large White Cabbage Butterfly,	186
The Apaturina Butterfly,	196
The Silver Stripe Butterfly,	197
The Andromacha Butterfly,	199
The Nicippe Butterfly,	201
The Radiated Butterfly,	203
The Small Copper Butterfly,	205
The Statirian Butterfly,	206
The Licarsis Butterfly,	207
The Helenus Butterfly,	208
The Phlegia Butterfly,	209
The Helius Butterfly,	210
The Amalthea Butterfly,	211
The Eutrepe Butterfly,	212

	Page
The Syncellus Butterfly,	213
The Charlotte Butterfly,	214
The Ludovica Butterfly,	215
The Belise Butterfly,	216
The Cleona Butterfly,	217
The Ricini Butterfly,	218

PREFACE

TO THE

SECOND EDITION.

THE very rapid sale of an extensive First Edition of the “Book of Butterflies, Sphinges, and Moths,” together with the favourable character which the British Press has bestowed on the Work, have induced the Proprietors to add an additional Volume, so as to render the book more perfect, by giving a variety of new and striking objects.

The Author has given, in the Third Volume, the modern arrangement of the *Papilionacea*, showing the new genera which have been formed from the Linnæan genera *Papilio*, *Sphinx*, and *Phalæna*. He has besides added directions for collecting, breeding, preserving,

and setting this interesting tribe of insects ; with a description of the instruments made use of for that purpose, which renders the third an indispensable companion to the two first volumes.

The Author has given a farther account of Silk, and a representation of that splendid insect, the Tusseh Moth of Bengal, with its caterpillar, one of those larvæ which produce silk.

PREFACE.

THE intention of the following little work is to give a popular view of the habits and economy of the most elegant of the Linnean orders of Insects, and, from the attractive beauty of the objects, to excite in the reader some inquiry into their history, which, although by no means so striking as that of many other departments of Entomology, is nevertheless sufficiently wonderful to deserve our admiration.

There are but few individuals who have not been struck with the resplendent and gorgeous colours of some of the Butterfly tribe: and where is the human being who can behold even the most simple and unadorned of the species, (the common Cabbage Butterfly,) without associating with it “the scenes of his childhood, so dear to the heart,” when chasing the wayward roamer from field to field? Who can meet with the pupa of one of these animals, without feeling

anxious to become acquainted with the extraordinary process by which so singular a production is transformed into an animal of such beauty?

There are few who have not, at one period of their lives, suffered in some way from the consuming powers of the caterpillars of various tiny Moths, who find ways of insinuating themselves into the inmost recesses of the most sacred repositories, and, if undisturbed, quickly destroy the finest cloths and most valuable furs. The means by which they effect this, forms not the least interesting part of their history.

Part of our inquiry will embrace the instincts and economy of an animal which has, for nearly two thousand years, contributed to our comfort, the elegance of our attire, and our commercial and mercantile prosperity,—namely, the Silkworm Moth. Of the millions who wear, in one form or another, the beautiful and durable fabrics manufactured from the cocoon of this little creature, how few, comparatively, know any thing of the habits of the animal by which it is produced! On this division of the subject

I have been pretty full, showing the extent and importance of the manufacture to Great Britain, as well as to many Continental States. If I have descended to too statistical a detail, I trust the importance of the subject will make amends for what naturalists might consider as a fault.

In the selection of illustrations, I have in some instances been guided more by the singularity of the shape and markings of the insect, than by the beauty and variety of the colours. It is not pretended that the figures are by any means entitled to consideration as works of art, but, such as they are, it is presumed that a work, requiring the same labour, and executed in a similar style, has not before been offered to the public at so cheap a rate; even on the Continent, where the price of labour is so much less than in Great Britain, and where paper is little more than half the price that it is in this country.

I have chosen the Linnean arrangement in preference to that of Latreille, or other celebrated modern authors: not that I think it more perfect, but because it will be more easily

understood by the general reader, for whose use the book is chiefly intended. I have, at the same time, as much as possible, stript the descriptions of such terms as can be understood only by the technical entomologist.

When the reader has perused this book, which embraces so trifling a department of Entomology, I hope that he may be induced to dip deeper into a science which, although it has been much neglected, abounds nevertheless in wonderful and diversified manifestations of creative wisdom. It contains, besides, objects of equal beauty to any other department of Natural History, possessed of forms which, if not so grand as that of the noblest of animated beings, are certainly more remarkable for the singularity of their conformation, and the striking peculiarity of their habits.

Entomology is, of all branches of natural science, the most comprehensive. There appears to be no limits to it; and I am convinced, that of the minuter species we do not know a fiftieth part. Microscopic investigation has shown, that,

so far as the power of a lens could lead us, the most minute insect we have yet discovered, is liable to be inhabited by a parasite still more minute than itself. The mind of man, in the contemplation of phenomena so astonishing, is lost in wonder.

Although Entomology met with some attention from the earliest natural historians, yet it has, till very lately, been much neglected, from the circumstance of its being considered a trifling and childish pursuit. We are told by Harris, in his description of the Plantain, or Glanville, Fritillary, (Plate 22. of this work,) that "This Fly took its name from the ingenious Lady Glanville, whose memory had nearly suffered for her curiosity. Some relations that were disappointed by her Will, attempted to set it aside by acts of lunacy; for they suggested, that none but those who were deprived of their senses would go in pursuit of Butterflies. Her relations and legatees cited Sir Hans Sloane and Mr Rac to support her character. The last gentleman went to Exeter, and on the trial

satisfied the judge and jury of the lady's laudable inquiry into the wonderful works of Creation, and established her Will." *

The accomplished and amiable Sir Joseph Banks, it will be remembered, came under the satirical lash of Dr Walcot's pen for a similar reason. But, notwithstanding, he has left behind him an imperishable name.

Another cause why this inexhaustible and interesting study till lately made so little progress in Britain, was the want of elementary books. But this is now completely obviated, first, by the delightful and amusing *Introduction to Entomology*, by Messrs Kirby and Spence, in four volumes, the first of which appeared in 1815; and, subsequently, by the more technical Introduction of Mr Samouelle; and, still more recently, by the popular productions of Professor Rennie, entitled *Insect Transformations*, *Insect Architecture*, and *Insect Miscellanies*.

The pursuit of nature carries along with it many charms, and there is no division of the

* HARRIS'S *Aurelian*, p. 27.

subject beneath the attention of man. “ Even in favour of the mere butterfly hunter, he who has no higher aim than that of collecting a picture of Lepidoptera, and is attached to insects solely by their beauty or singularity, it would not be difficult to say much. Can it be necessary to declaim on the superiority of a people, amongst whom intellectual pleasures, however trifling, are preferred to mere animal gratifications? Is it a thing to be lamented, that some of the Spitalfield weavers occupy their leisure hours in searching for *Papilio Adonis*, and others of the more splendid Lepidoptera, instead of spending them in playing at skittles, or in an alehouse? Or is there, in truth, any thing more to be wished than that the cutlers of Sheffield were accustomed to employ their *Saint Mondays*, and to recreate themselves after a hard day’s work, by breathing the pure air of their surrounding hills, while in search of this ‘untaxed and undisputed game?’ ”*

Crabbe, in his poem of *The Borough*, beau-

* KIRBY and SPENCE’S *Introduction to Entomology*, vol. i. p. 43.

tifully illustrates the pleasure to be derived from pursuits of this kind:—

Oft have I smiled the happy pride to see
 Of humble tradesmen in their evening glee,
 When of some pleasing fancied good possest,
 Each grew alert, was busy, and was blest ;
 Whether the call-bird yield the hour's delight,
 Or, magnified in microscope, the mite,
 Or whether tumblers, croppers, carriers, seize
 The gentle mind, they rule it, and they please.
 There is my friend the weaver,—strong desires
 Reign in his breast ; 'tis beauty he admires :
 See ! to the shady grove he wings his way,
 And feels in hope the rapture of the day ;
 Eager he looks, and soon to glad his eyes,
 From the sweet bower by Nature form'd, arise
 Bright troops of virgin moths, and fresh-born butterflies,
 Who brake that morning from their half-year's sleep,
 To fly o'er flowers, where they were wont to creep.
 Above the sovereign oak, a sovereign skims,
 The Purple Emp'ror, strong in wing and limbs ;
 There fair Camilla takes her flight serene,
 Adonis blue, and Paphia, silver queen ;
 With every filmy fly, from mead to bower,
 And hungry Sphinx, who threads the honey'd flower ;
 She o'er the Larkspur's bed, where sweets abound,
 Views ev'ry bell, and hums the approving sound ;
 Poised on her easy plumes, with feeling nice,
 She draws from every flower, nor tries a floret twice.
 He fears no bailiff's wrath, no baron's blame,
 His is untax'd and undisputed game.*

We hope the time is now gone by when a defence of any department of natural history is necessary. Should any one ask what is the use of the pursuit, we would answer, first, that in a contemplation of the many wonders which present themselves, even in the study of Butterflies, Sphinges, and Moths, there will be found much to excite our admiration, and sufficient to show us that a knowledge of their history enables us to guard against the ravages of some of the destructive species. It also enables us to turn the produce of others to highly useful purposes, and even to give employment to tens of thousands of our fellow men. But a consideration, of a still higher kind than its palpable utility, recommends the study of Nature to mankind: it is an inexhaustible source of rational and innocent amusement, and a delightful exercise of our reasoning faculties. In surveying the wondrous works of Creation, even in the simplest of forms, we are naturally led to admit the truth of the maxim, that "the contemplation of Nature raises the mind up to Nature's God."

There can hardly remain a doubt, that all His works were designed to afford His rational creatures useful and pleasing instruction. The wisest of men says, "Go to the ant, thou sluggard, and be wise."* The inspired Jeremiah says, in reference to the knowledge of the stork and swallow, that they are aware of their "appointed times," and "the times of their coming."† Our Saviour directs the attention of man to the fowls of the air, and the lilies of the field, as affording good moral lessons. St Paul, in his refutation of the gainsayers in their philosophical unbelief, impugns their false doctrines, by an illustration of the possibility of the resurrection from the dead, drawn from the ordinary process of vegetation.‡ A closer analogy will, however, I think, be found in the transformation of Insects; as is more fully illustrated in our observations on the Ocellated Sphinx.||

Wherever the student of Nature turns his eye, he perceives objects which command his

* PROVERBS, vi. 6.

† CORINTHIANS, xv. 36, &c.

‡ JEREMIAH, viii. 7.

|| Plate 62.

admiration and his wonder; deep reflection on these leads him to

Find tongues in trees, books in the living brooks,
Sermons in stones, and good in every thing.

“ In a *moral* view,” says an anonymous writer, “ I shall not, I believe, be contradicted when I say, that, if one train of thinking be more desirable than another, it is that which regards the phenomena of nature with a constant reference to a supreme intelligent Author. To have made this the ruling, the habitual sentiment of our minds, is to have laid the foundation of every thing which is religious. The world thenceforth becomes a temple, and life itself one continued act of adoration. The change is no less than this; that whereas, formerly, God was seldom in our thoughts, we can now scarcely look upon anything without perceiving its relation to Him. Every organized natural body, in the provisions it contains, for its sustentation and propagation, testifies a care on the part of the Creator, expressly directed to these purposes. We are on all sides surrounded by such

bodies—examined in their parts, wonderfully curious—compared with one another, no less wonderfully diversified—so that the mind, as well as the eye, may either expatiate in variety and multitude, or fix itself down to the investigation of particular divisions of the science. And in either case it will rise up from its occupation possessed by the subject in a very different manner, and with a very different degree of influence, from what a mere assent to any verbal proposition which can be formed concerning the existence of the Deity—at least that merely complying assent with which those about us are satisfied, and with which we are too apt to satisfy ourselves—will or can produce upon the thoughts. More especially may this difference be perceived in the degree of admiration and of awe with which the Divinity is regarded, when represented to the understanding by its own remarks, its own reflections, and its own reasonings, compared with what is excited by any language that can be used by others.”

INTRODUCTION.

THE wonderful metamorphoses of insects affords a pleasing subject of contemplation to the human mind ; and what in early ages seems to have been known as an undoubted fact, especially by the Greeks and Romans, was held to be merely imaginary in Britain, so late as the year 1634. Sir Theodore Mayerne, who edited Mouffet's work on insects, entitled, *Insectorum sivi Animalium Theatrum*, says, " that if animals are transmuted, so may metals."

These astonishing and diversified transitions in the insect tribes, so well known to the ancients, gave a colouring to, and excited a belief in, many of the metamorphoses recorded by their poets. They were utterly unacquainted with the truths of modern physiological discoveries, so that the fact of a caterpillar being transformed into a butterfly, must have appeared to them sufficient to upset all unbelief in the

transmigration of souls. There can be but little doubt that the principles of metempsychosis originated from this cause. Nothing could appear to them more confirmatory of the doctrine, than that an inert aurelia should be again transformed into a living body. The only method they had for accounting for this was, that it had been tenanted by the soul of some wretch whose misdeeds on earth had merited such a pilgrimage.

In the institutes of Menæ, we are told that a priest who has drunk wine, shall migrate into a moth or fly, and be doomed to feed on ordure; and that the man who steals gold from a priest, shall inhabit a thousand times the bodies of spiders. If any one steal honey, he shall be reborn a great stinging gnat. Shakspeare puts the same idea into the words of old Christopher Sly, the drunken tinker, in the Induction to the *Taming of the Shrew*. “Am I not old Sly’s son, by birth a pedlar, by education a card-maker, by *transmutation* a bear-herd, and by profession a tinker?”

The story of the phoenix arising from its own ashes, is no doubt of similar origin. The tradition is, that it lives five or six hundred years in the wilderness, and when thus advanced in age, builds

itself a pile of sweet wood and aromatic gums, and firing it with the wafting of its wings, thus destroys itself ; while from its ashes arises a worm, which in time grows up to be again a phœnix.

In the *Annals of Tacitus*,* it is stated, that, in the year 787 of Rome, the phœnix revisited Egypt, which created much speculation among the learned. The accounts of the longevity of this creature vary from five hundred to one thousand five hundred years. It was considered sacred to the sun.

The ancients made many allusions to the wonderful changes which the insect tribes undergo, and built a number of their fictions on them. The mythological tale of Cupid and Psyche, is an allegory of the human soul, which is sometimes cherished, and sometimes tormented by the passions. Psyche, in Greek $\psiυχη$, signifies the soul, as also a butterfly ; showing that the ancients were sufficiently struck with the transformation of the butterfly, and its revival from a seeming temporary death. Cupid is an emblem of desire. Psyche is frequently represented by a butterfly, not merely from the beautiful appearance of that insect, but on account of its sur-

* Book vi. sect. 28.

viving the chrysaliscondition; and this breaking from its confinement, certainly finely designates man's future existence, after he shall rise from the dead. This fable is perhaps the invention of Apuleius, as no mention of Psyche, nor any allusion to such amours of Cupid, occurs in any Greek or Latin writer of an earlier date. Apuleius calls it an old woman's story; and puts it into the mouth of an old hag in a cave of robbers, to sooth the grief of a young lady their captive.

It is worthy of remark, that the figures of Cupid and Psyche embracing, are found on many of the gems called Abraxas, from the name of the Egyptian deity, whose worship the Gnostics and Basilidians in Syria and Egypt contrived to blend with misconceived notions of Christianity. These gems were used as amulets, or charms, against various maladies and perils.

The learned senator Philip Buonarotti, attempts to show that the fable of Cupid and Psyche is derived from the solemn mysteries of love, celebrated among the Thespians, &c., and carefully concealed from the profanation of the vulgar eye. It is highly probable that of the many gems in which the God of Love is variously represented, with or without the butterfly,

a great number are anterior to the time of Apuleius, and allude to sacred ceremonies: that the butterfly was displayed in these rites as a symbol of the soul; and that the gems which bear the figure of Cupid chasing, tormenting, caressing, and sporting with a butterfly, are emblematic of desire acting on the human soul: but it does not follow that they have any allusion to a fiction resembling that of Apuleius. They are probably founded on allegories of more ancient and more sublime invention.

These days are gone by; the metamorphoses, now thoroughly known, have been stript of their tales of marvel.

The transformations of insects, more correctly speaking, consist rather in a series of developments than in any absolute metamorphosis; being only a transition of changes in organs which lay concealed from human view, the caterpillar being compound in its nature, with the germs of the *imago* state hidden in a succession of cases. The first is the covering of the pupa, which is concealed within three or four mantles, the one over the other; these will in succession enrobe the larva, and, as it enlarges, the parts become visible, and are alternately thrown off, until the perfect insect emerges from its confinement.

The celebrated Swammerdam found, by dissection, the skins of the larva and pupa enveloped in each other, and also the butterfly with all its organs, but these in a fluid state. Malpighi discovered within the chrysalis of a silkworm, that was only a few days old, the eggs of the future moth : and those of the *Bombyx dispar* were discovered by Reaumur within the caterpillar, only seven days before its change into the aurelia state.

Although these discoveries disprove all miraculous intervention, still we are wonderstruck on reflecting that this simple larva, when first it emerges from the egg, not thicker than a thread of silk, should contain its own triple, or in some cases its octuple covering,—the mask of an aurelia and a butterfly, folded in the most astonishing manner over each other ; and besides these, different respiratory and digestive organs, a nervous system, and muscles of motion peculiar to each stage of its existence. It is inconceivable how these successive changes should be effected, through the agency of the food which it takes into its stomach during the caterpillar state. And what is still more incomprehensible, is, that this stomach, at one time, is incapable of digesting vegetable food, the nectar of flowers being all it can

contain. In this perfect condition, it is deprived of the very organs by which it could feed on vegetable matter, and is supplied by a proboscis for sipping the honey. It is no less remarkable, how, at one period of its existence, it emits from that stomach a substance for the formation of silky filaments, which, in its imago condition, it is incapable of doing.

The knowledge of all these facts shut out the strict analogy which existed, before their discovery, between the transformation of lepidopterous insects, and the resurrection of the human body ; yet it affords a striking picture of that eventful change. Swammerdam, the very person whose discoveries have rendered this analogy less complete than it had been before his time imagined, was nevertheless deeply impressed with the singular transitions, and says, “ this process is formed in so remarkable a manner in butterflies, that we see therein the resurrection painted before our eyes, and exemplified so as to be examined by our hands.”*

The Rev. Mr Kirby makes this interesting allusion to the subject : “ But although the analogy between

* HILL'S *Swammerdam*, vol. i. p. 127, *a*.

the different states of insects, and those of the body of man, is only general, yet it is much more complete with respect to his soul. He first appears in this frail body—a child of the earth—a crawling worm—his soul being in a course of training and preparation for a more perfect and glorious existence. When it has finished this course, it casts off this vile body, and goes into a hidden state of being in Hades, where it rests from its works, and is prepared for its final consummation. The time for this being arrived, it comes forth clothed with a glorious body, not like its former, though germinating from it, for though ‘ it was sown an animal body, it shall be raised a spiritual body,’ endowed with augmented powers, faculties, and privileges commensurate to its new and happy state. And here the parallel holds perfectly between the insect and the man. The butterfly, the representative of the soul, is prepared in the *larva* for its future state of glory ; and if it be not destroyed by the Ichneumons and other enemies to which it is exposed, symbolical of the vices that destroy the spiritual life of the soul, it will come to its state of repose in the *pupa*, which is its Hades ; and at length, when it assumes the *imago*, break forth with new powers and beauty to its final glory, and the

reign of love. So that, in this view of the subject, well might the Italian poet exclaim,—

Non v'accorgete voi, che noi siam vermi,
Nati a formar l'angelica farfalla?*"•

These ideas are beautifully developed in the following little poem, in which the progress of the insect is correctly depicted:—

THE BUTTERFLY'S BIRTHDAY.

THE shades of night were scarcely fled,
The air was mild, the winds were still,
And slow the slanting sunbeams spread
O'er wood and lawn, o'er heath and hill.

From fleecy clouds of pearly hue
Had dropt a short but balmy shower,
That hung like gems of morning dew
On every tree and every flower.

And from the blackbird's mellow throat
Was pour'd so loud and long a swell,
As echo'd with responsive note
From mountain side and shadowy dell.

When, bursting forth to life and light,
The offspring of enraptured May,
The BUTTERFLY, on pinions bright,
Lanch'd in full splendour on the day.

* Do you not perceive that we are caterpillars, born to form the angelic butterfly?

Unconscious of a mother's care,
No infant wretchedness she knew ;
But as she felt the vernal air,
At once to full perfection grew.

Her slender form, ethereal light,
Her velvet-textured wings enfold ;
With all the rainbow's colours bright,
And dropt with spots of burnish'd gold.

Trembling with joy a while she stood,
And felt the sun's enlivening ray ;
Drank from the skies the vital flood,
And wonder'd at her plumage gay !

And balanced oft her broider'd wings,
Through fields of air prepared to sail ;
Then on her vent'rous journey springs,
And floats along the rising gale.

Go, child of pleasure, range the fields,
Taste all the joys that Spring can give.
Partake what bounteous Summer yields,
And live, whilst yet 'tis thine to live.

Go, sip the rose's fragrant dew,
The lily's honey'd cup explore,
From flower to flower the search renew,
And rifle all the woodbine's store ;

And let me trace thy vagrant flight,
Thy moments, too, of short repose,
And mark thee then with fresh delight
Thy golden pinions ope and close.

But hark ! whilst thus I musing stand,
Pours on the gale an airy note ;
And, breathing from a viewless hand,
Soft silvery tones around me float !

They cease—but still a voice I hear,
A whisper'd voice of hope and joy,
“ Thy hour of rest approaching near,
Prepare thee, mortal ! thou must die !

“ Yet, start not !—on thy closing eyes
Another day shall still unfold,
A sun of milder radiance rise,
A happier age of joys untold.

“ Shall the poor worm that shocks thy sight,
The humblest form in Nature's train,
Thus rise in new-born lustre bright,
And yet the emblem teach in vain ?

“ Ah ! where were once her golden eyes,
Her glittering wings of purple pride ?
Conceal'd beneath a rude disguise,
A shapeless mass, to earth allied.

“ Like thee the hapless reptile lived,
Like thee he toil'd, like thee he spun,
Like thine his closing hour arrived,
His labour ceased, his web was done.

“ And shalt thou, number'd with the dead,
No happier state of being know ?
And shall no future morrow shed
On thee a beam of brighter glow ?

“ Is this the bound of power divine
To animate an insect frame ?
Or shall not he who moulded thine,
Wake at his will the vital flame ?

“ Go, mortal ! in thy reptile state,
Enough to know to thee is given ;
Go, and the joyful truth relate,
Frail child of earth, high heir of heaven !”

It would be difficult to assign a cause, why insects undergo so many changes before arriving at a state of maturity. Why is it that they do not, like other animals, preserve the same general form from infancy to perfection ? This is a question which is not easy to answer, but no doubt the thing was wisely ordered by the Creative Power. We know, however, that one very important part is assigned to insects,—that of destroying the redundancy of decaying animal and vegetable matter ; and in performing this office, few agents could be more effectual ; for, in the larvæ state, they are not only extremely voracious, but, possessing a stomach nearly the size of their whole body, and having rapid digestive powers, are capable of consuming an immense quantity of food. This period of their existence is by far the longest. Having allayed their almost insatiable voracity, and completed the materials for the development

of those organs which are destined to form their future corporeal condition, they become an aurelia, during which state they are quite inert, and without any cravings of hunger. Thereafter they assume the imago, or perfect condition, when, in general, their stomachs are contracted to a tenth of their former capacity; and they frequently exist without food at all, or only sip the nectar of flowers. After this period, the chief aim the animal seems to have in view, is to propagate its kind, and no other object can divert it from its purpose.

The new relations which this singular arrangement introduces into nature, are not less wonderful than striking; for one individual animal combines in itself three animals, in all respects specifically different, whose manner of existing, and alimentary nourishment, are diametrically opposite.

Several of the vertebrate animals, such as frogs, toads, and water newts, undergo metamorphoses in some respects analogous to those of the insect tribes; the first form of these being a tadpole, which is widely different from that which they afterwards assume. These reptiles, too, as well as snakes, cast their skins by an operation somewhat similar to the larvæ of insects. There is nothing, however, in

their metamorphosis at all resembling the pupa, or chrysalis state in insects.*

All insects pass through four states,—namely, that of the egg; the larva, or caterpillar; the pupa, or chrysalis; and the imago, or perfect insect. So called by Linneus, because the creature has thrown off its mask, and has become a perfect *image* of its species. These different forms I shall treat in succession. The egg state will apply to the whole order; but I shall only enter into a general account of the physiology of the larvæ condition, as applied to the three genera, Butterflies, Sphinges, and Moths, and give a detailed account, in the first instance, of Butterflies; reserving the most singular facts which are connected with the history of Moths, to precede the description of the animals of that genus.

When we alter the soil of a country by agricultural operations, plants will follow, of their own accord, the progress of man's improvement; and wherever plants are introduced, animals are certain to find their way thither. It would be difficult to give a satisfactory account how this takes place. Let brassicas be introduced into the most remote

* See KIRBY and SPENCE, *Intr. v. pl. i. p. 31.*

valleys, which were formerly the receptacles for dry heaths and furze, if they increase to any extent, caterpillars will certainly be found in them; if nettles are by any means introduced, the beautiful butterflies which feed on them are sure to be found there; and as these again increase, insectivorous birds will become resident on the spot. In confirmation of this fact, Mr Loudon says, " Having made some oak plantations, though only on a small scale, near my residence, I have occasionally found therein *Thecla quercus*, (Purple hair-streak Butterfly,) and *Milita euphrosyne*, (Pearl-bordered Fritillary,) insects which previously had never been seen within some miles of the spot. I have seldom planted the Athenian poplar without finding it taken possession of by *Smerinthus populi*, (Poplar Hawk Moth,) and *Cerura Vinula*, (Puss-Moth,) and by other less common *Phalœnidæ*. The copious growth of broom in our plantations induced, for several seasons, the appearance of *Phalœna Spartiata*, (the Broom Moth, *Chesias Spartiata* of Stephens,) a species which I had not observed before, and which has disappeared again since the removal of the broom on which the larva feeds. The Caterpillar of *Acherontia Atropos*, (Death's-head Sphinx,) it is well known, feeds on

the potato, the very extensive cultivation of which vegetable root in the present day, will at once account for the far more frequent occurrence of this fine insect of late years than formerly. We are informed, by an able practical entomologist, that some of the fir-feeding Lepidoptera, (the French *Sphinx pinastri* and *Geometra pinivaria*,) which formerly occurred in scarcely any other part of this island, save Scotland or the north of England, have of late years, since the growth of firs has been more extensively encouraged, been taken, one or both of them, in great abundance in the more northern parts.* The same law, or something analogous to it, holds good also in the vegetable world. Plants sometimes spring up, as it were spontaneously, or at least nobody knows how, as soon as the soil and situation are rendered suitable to their growth."

The field of Nature is of vast and ever boundless extent, and the objects which lie within it are exceedingly numerous and diversified. To the mind, therefore, that has acquired a relish for cultivating a knowledge of natural objects, it never fails to prove an inexhaustible source of amusement.

* See HAWORTH'S *Lepidoptera Brit.* p. 278, 279.

The physical sciences have a strong tendency to arrest the attention of the youthful mind, being replete with striking phenomena ; and, in mature years, few can pursue the study of Nature without acquiring an ardent zeal for the extension of their knowledge. The varied forms which daily present themselves to the inquiring eye, give the mind a strong bias for observation and reflection. Hence the utility of introducing natural history as a preliminary branch of education ; and it would be well if people of rank and fortune would see the importance of instilling a love of the natural sciences into the infant minds of their offspring, when they are yet alive to the influence of early impressions. They might thus be preserved from those ignoble pursuits which are the too general concomitants of wealth and rank.

THE
BOOK OF BUTTERFLIES.

CHAPTER I.

ON THE PHYSIOLOGY OF THE EGGS OF PAPILIONACEOUS
INSECTS, AND THEIR MODE OF HATCHING, &c.

BUTTERFLIES, Sphinges, and Moths, like the whole known species of insects, are strictly oviparous animals.

There is an unerring foresight possessed by the female, that of depositing her eggs in the precise place where food, suitable to the existence of the caterpillar after its exclusion, is found. With very few exceptions the eggs are enveloped in an adhesive cement, which fixes them to the spot on which they are deposited. When eggs are extruded singly, this cement generally envelopes each individual with a thin coating, as in the case of the Admirable Butterfly, (*Vanessa atalanta*;) but when they are deposited

in groups, the cement is generally spread over the whole, as in the instance of the White Satin Moth, (*Leucoma Salicis* of Stephens.) This glutinous substance is evidently intended by nature to prevent the eggs from being carried from the place selected by the mother insect for their depository. The *Hipparchia Hyperanthus*, another butterfly, deposits her eggs at random, on different plants. The caterpillar of this insect is polyphagous. It has been observed that all larvæ which live in solitude, proceed from eggs laid singly by the female butterfly, which is provided with an instrument for the purpose. De Geer mentions, that these eggs are in some instances deposited with great rapidity; especially by the Common Moth, called in many places of England the Ghost, (*Hepialus Humuli*.) This insect lays a large number of minute black eggs, resembling the grains of fine gunpowder. She ejects them so fast, and with such force, that their extrusion resembles the shot from a pop-gun.

It is a curious fact that the female insects of those whose larvæ spend a solitary life, or those which live in societies, take the utmost care to deposit their eggs in a manner corresponding to the state in which the future caterpillars are destined to exist.

Several species of Moths cover their eggs with a thick coating of the hair stripped from their own bodies. This is particularly the case with the *Arctia chrysorrhæa*, and *Hypogymna dispar*. They pluck

off this hair with the pincers, which are at the point of their ovipositors. A downy-like bed is first formed on the surface of some leaf, upon which they place in succession layers of eggs, taking care to surround them with a coating of a similar kind. When they have deposited the whole number, they lay a neat thatched-like roof of hair over the surface.

These little creatures are endowed with a peculiar instinct, which looks remarkably like intelligence ; for the hairs employed in forming the inside of the nest are placed promiscuously, while those used for the external covering, are arranged with perfect regularity, and such skill, that they render the nests impervious to water ; one layer lies over the other, with such neat precision, that, as Mr Kirby says, the whole resembles a well-brushed piece of shaggy cloth, or fur. When the female has finished her labour, in which she is usually employed about twenty-four hours, and in some cases forty-eight, her body, which was before thickly beset with hair, is now rendered quite naked. She has thus denuded herself for her offspring's sake, and, having completed the last task assigned to her by Nature, she finishes her earthly pilgrimage, and expires.

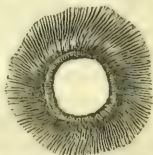
Creative power has made provision for the fulfilment of all these singular instincts in a wonderful manner. The little Gipsy Moth (*Hypogymna dispar*) does not exist in its perfect condition more than fourteen days, and often not more than a week.

The male is not furnished with this down, as it is of no use to him.

When the female Gipsy Moth is on the eve of laying her eggs, she places herself on the trunk of an elm or oak, and always with her head downwards. In this situation she continues to place her eggs one above the other, in the shape of an inverted cone. Her first care is to make a small bed of down, into which she places the egg intended to form its apex ; and the egg being covered with a glutinous substance, attaches itself to all the fine downy hair, and at the same time adheres to the tree. In this employment she continues for many hours, adding to the cone, and taking rest at intervals ; and as frequently does she protect her eggs by a layer of down. The following is a representation of the Gipsy Moth, in the act of laying her eggs, with the shape of the cone when completed. The cut represents the Moth half the size of nature.



Professor Rennie mentions having picked up some specimens of the Gipsy Moth in the Netherlands, and enclosed them in chip boxes. On opening one of these some time afterwards, he found that one of the moths had deposited her eggs; but, owing to the situation not being favourable, they were laid in the form of a wheel, of which her body was the radius, as represented in the following figure:



The rim of this wheel was about a quarter of an inch broad, and regularly sloped like a candle shade, and had down laid all around it in an imbricated manner. Another of these captives, although in a box of the same size as the other, instead of forming a wheel, laid the eggs in a conical form, like a little mound. The Professor conceives that this form might have been assumed in consequence of the moth, in all probability, having laid part of the eggs before being captured, as it did not contain above a sixth of the number which the other deposited. The same general slope was, however, preserved, and it was as regularly thatched as the other, as represented in the following figure:



These eggs produced, when in the possession of Mr Rennie, in April 1830, a numerous brood of caterpillars.

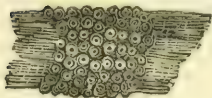
As these eggs are laid in August, and destined to endure the storms of winter, the female seems to have some foresight of this, in forming so compact and appropriate a covering, constructed on principles equal to the best devised methods of human ingenuity. It is the spring of the year before they are hatched, when the elm comes into leaf.

The whole number of eggs laid by one female is frequently placed in a single group, and at other times in several smaller ones; either considerably apart, on the same plant, or on others which are contiguous. The parent insect seems to hold in view, in the latter case, the impropriety of ovipositing more in one situation than will supply the quantity of food sufficient to satisfy the wants of the excluded caterpillars.

There is great diversity in the arrangement of the eggs after extrusion. Sometimes they are deposited in confused masses; but in general, they are arranged in the most orderly and even systematic manner. The common Cabbage Butterfly, with various other insects, place their eggs upon one end, ranked close together in perfect order: by this

arrangement the larvæ, which on hatching emanate from the upper end, cannot disturb the adjoining eggs. The eggs of many Papilios are so formed, that it is evident they are intended to be placed in this position. For example, those of the Puss Moth (*Cerura Vinula*) have the case of a gummed transparent substance, while the rest is cinereous and opaque. The Emperor Moth lays eggs, by which the caterpillar can make an easy retreat ; these are piled on their side, in the same manner as bottles of wine in a cellar.

The Lacky Moths (*Clisiocampa neustria*,) deposit their eggs on the twigs of trees, on which they are arranged with such extraordinary regularity and neatness, that they resemble pearls set by the hand of the most skilful jeweller. Hence the name given to them by gardeners of " Bracelets." They are deposited in close spiral circles, of from fifteen to seventeen distinct rows, having their interstices filled up with a tenacious brown gum, which secures them against the winter's cold, and preserves them from the attacks of devouring insects. Each of these depositions consists of two or three hundred pyramidal eggs with their tops flattened, having their axes perpendicular to the circumference of the twig to which they are attached, which will be more easily understood by the following figure :



It is not very easy to imagine how these little animals can accomplish this beautiful arrangement, by means of their tail and feet, in such a manner, that the hand of man could not perform it with greater exactness and nicety. The ingenious Reaumur made many ineffectual attempts to investigate this operation, but in vain. He reared numbers of the moth from the eggs, and supplied the females with appropriate twigs; but they most pertinaciously avoided the accustomed symmetrical regularity of their kind, and extruded their eggs at random.*

The following is a representation of the eggs of some unknown moth, which in some years may be seen rather plentifully in orchards, deposited in a manner very similar to that of the Lackey Moth:



In depositing its eggs, the female Vapourer Moth (*Orayia antiqua*) takes care to avail herself of the

* REAUMUR, i. p. 95.

pupa case, which she has recently left. This envelope is lined with a fine soft silky substance, which forms a comfortable asylum for the eggs. Swammerdam says, that "this custom of fastening the eggs to the web in a constant method, and by the immutable law of Nature, is so peculiar to this species of insects, that I have never observed it in any other kind whatsoever. This female, like a most prudent housewife, never leaves her habitation, but is always fixing her eggs to the surface of the web out of which she has herself crept, thus affording a beautiful instance of industrious housewifery."

A strong reason for the domesticated habits of this female moth, is her wings being so very short that they are of little use in rendering her buoyant; and of that description which naturalists call rudimentary wings. This is also the case with the females of some other moths. So different are these females from the males, that they may be taken for animals of distinct genera. Their bodies are broad and thick, in proportion to those of the males, and the wings excessively small, as will be seen by the following figure of the female Vapourer Moth:



On the other hand, the wings of the male are

extremely large, in proportion to the size of the body, as exemplified in the figure beneath :



There can be little doubt that the silken web keeps the eggs in a proper temperature during winter. These cocoons are besides always under the shelter of some wall, or in the hollow of a tree. Silk is known to be an excellent non-conductor of electricity, and therefore must preserve the eggs in an equable temperature. The following is the appearance presented by the eggs laid in the cocoon, from which the female has issued :



I shall revert to this subject again, when treating of Moths, and give examples of many peculiarities in the different species, and of the manner in which they deposit their eggs.

In reference to the degree of cold which the eggs of insects can endure, I shall give the ingenious ex-

periments of John Hunter and Spallanzani on this interesting subject. Indeed, the heat also which they are capable of withstanding, is not less astonishing.

“ Intense cold,” says Spallanzani, “ does not destroy the eggs of insects. The year 1709 was celebrated for the intensity of its cold, and its fatal effects on animals and plants. Fahrenheit’s thermometer fell to 1°. ‘ Who can believe,’ exclaims Boerhaave, ‘ that the severity of this winter did not destroy the eggs of insects, especially those exposed to its influence in open fields, on the bare earth, or on the exposed branches of trees ! Yet the general warmth of spring having again tempered the air, these eggs were hatched, and as numerous as in the mildest winters.’ Since that time, there have been winters still more severe ; for in France, as well as in several other European states, in December 1788, the thermometer fell considerably beneath that of 1709.

“ I subjected eggs of several insects to a more severe trial than in the winter of 1709. Among others were those of the Silkworm Moth, and the Elm Butterfly, (*Vanessa polychloris*,) which I enclosed in a glass vessel, and buried five hours in a mixture of the ice and rock salt, when the thermometer fell six degrees below zero ; notwithstanding which caterpillars were extruded from all the eggs, and exactly at the same time with those which had not been subjected to this experiment. In the

succeeding year, I exposed them to a still greater degree of cold. I prepared a mixture of rock salt and nitrate of ammonia, and reduced the thermometer to twenty-two degrees below zero, which was twenty-three degrees lower than the cold of 1709. They suffered nothing from this rigorous treatment, as they were hatched in due season.

“ From these combined facts we must conclude, that cold is less prejudicial to germs and eggs, than to animalcula and insects. In general, it is found that germs can survive the cold of two degrees below zero ; while it is known that some animalcula die at the freezing point, and others at about twenty degrees. The eggs of various insects are productive after being exposed to a temperature of twenty-two degrees below zero, while insects themselves die at sixteen and fourteen degrees. This I have proved in the eggs of the Silkworm Moth, and of the Eln Butterfly ; and although I ascertained that some insects can stand a great degree of cold, I have invariably found it to be in a much less ratio than what can be resisted by their eggs. What can be the cause of this great difference ? Insects killed at sixteen and fourteen degrees, are so completely penetrated and frozen, that their members do not yield to the pressure of the finger, and even under the knife they appear perfect ice. This is not the case with eggs ; for the contents of the shell, or crust, remain quite fluid under the influence of the

greatest cold; which can be ascertained by squeezing them with the nail of the finger. This may arise from their constituent parts being oleaginous or spirituous, or from some inherent principle adapted to resist the power of cold."

We are not at all enlightened by what Spallanzani has offered as a cause why eggs are enabled to resist the effects of cold, as he has given us no satisfactory explanation of the phenomenon.

He proceeds, "If eggs do not freeze, it is probable that the included embryos do not freeze. Is there anything surprising, therefore, that they are capable of resisting that cold which proves fatal to their contained insect when produced? Perhaps, for the same reason, (and I can perceive no applicable objection,) animalcula concentrated, or in the germ, can support a degree of cold which they are incapable of enduring when emerged.

"It may be asked, as the temperature of freezing still retains a portion of heat, why should it not develop the germs of the most minute animalcula? If we had never seen any eggs hatched but those of birds, which require a hundred and four degrees, we should have naturally concluded that all others required the same. A slight knowledge of the physiology of minute animals, instructs how many kinds produce at a much lower temperature. The eggs of butterflies and many other insects hatch at a temperature so low as forty-five degrees. If these

eggs emerge at fifty-nine degrees lower than is required for the development of birds, what difficulty can we have in believing that at thirteen degrees less than the freezing point, other animals are capable of being hatched? Nor should I be surprised at being told, that there are animals whose eggs would hatch in a much greater degree of cold, after being aware that there are plants, which are beings so similar to animals, that flourish amidst the regions of winter, and even fructify."

From the experiments of John Hunter, we find that a hen's egg will freeze by a great degree of cold, while, at the same time, it is possessed of a principle of vitality which prevents its destruction; but, if once that principle is destroyed, cold operates on it more easily. He mentions that an egg was frozen by the cold of zero. After it was thawed, and again exposed to the same depth of cold, it froze seven minutes and a half sooner. A new laid egg took an hour to freeze in fifteen and seventeen degrees; but when again exposed, it froze in twenty-five degrees, in half that time.*

With all these facts before us, we are warranted in coming to the conclusion, that cold does not destroy the vital principle in the eggs of insects; and it has been often noticed that, after a severe winter, insects were more numerous in the succeeding spring and summer.

* See HUNTER on the *Animal Economy*.

We now proceed to give an account of the substance of the eggs of Lepidopterous Insects. These, like those of birds, consist, first, of a coat or shell, which is strong, flexible, and much of the consistence of honey. It will not easily yield to the knife. It contains little calcareous matter, if any at all, and consequently resists the action of the muriatic and other acids.

With the composition of the fluid, which is contained in these minute shells, we are not at all acquainted, and can only suppose that it is analogous to the white and yolk of birds' eggs. When the egg has arrived nearly to the time of hatching, the embryo may be distinctly seen by the use of a strong microscope. It is coiled up in an annular form, as in the following figure of the egg of a Priest-hawk Moth, (*Sphinx Ligustri*.)



Some of the eggs of this order of insects are covered with hair, or a downy substance, as may be instanced in those of the Figure-of-eight Moth (*Bombyx cæruleocephala*.)

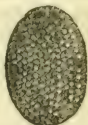
There is considerable variation in the number of eggs laid by different species. The Silkworm Moth, (*Phalœna mori*,) lays five hundred; the Great Goat Moth, (*Cossus ligniperda*,) one thousand; and the Tiger Moth, (*Callimorpha Caja*,) one thousand six

hundred. This may be considered extraordinary fecundity in such small animals ; but, compared to the Queen Bee, it sinks into insignificance ; for she extrudes the extraordinary number of 2,419,200 in a lunar month, and exceeds in fruitfulness every other animal in the world.

Some of the larger fishes lay vast numbers of eggs ; for Lewenhoeck has ascertained that the sturgeon's roe contains 1,500,000, and the codfish deposits the amazing number of 9,000,000.

The eggs of birds are all nearly of the same shape, which is supposed to arise from the similarity of the form of these animals. The eggs of insects, on the contrary, are infinitely varied in their forms, and why this should be the case, it is not easy to conjecture. Dr Paley has justly remarked in his *Natural Theology*, that the cause of these differences of forms is, for the most part, concealed from human investigation. Besides the dissimilarity of shape, they have a character which distinguishes them from all the eggs of other oviparous animals, being for the most part externally ornamented with a variety of beautiful figures. Some are figured on one side, and plain on the other ; while the eggs of the Tusseh Silkworm, (*Attacus pappea*), and some other of the Moths of the division Bombyx, are always orbicular, and depressed with a central cavity above and below, and have their circumference crossed with wrinkles, corresponding with the rings of the enclosed embryo.

There are others which are figured all over. In the butterfly *Hipparchia Aegeria*, all the surface is covered with hexagonal reticulations, as under :



In the new and restricted genus *Vanessa* of the French authors, we find two species of butterflies, which differ but little in their forms, the chief distinction being, that the one is much larger than the other : yet the eggs are so dissimilar, that they would indicate insects of a totally different form. Those of the small Tortoise-shell Butterfly are of a cylindrical shape, with eight prominent ribs, as under :



While the eggs of the large Tortoise-shell Butterfly are of a flask shape, and quite smooth, as represented beneath :



The following are striking varieties of the eggs of Moths:

AN EGG OF THE ANGLE SHADES MOTH.



This egg greatly resembles an Echinus or Sea Urchine.

TWO EGGS OF THE LACKEY MOTH.



These are widely different from any we have yet represented, and yet, in the insects themselves, there is but little variation of form.

The eggs of the Cabbage Butterfly are of an upright longitudinal shape, neck very finely ribbed, not unfrequently concealed by elevated ridges, crossing them at right angles, as under :



Those of the Meadow Brown Butterfly (*Hipparchia Janira*) are crowned by imbricated scales like the tiles of a roof, as in the following figure :



The period of hatching varies according to the state of the atmosphere. A certain degree of heat is also necessary to the exclusion of the caterpillar. This heat is in most instances derived from the state of the air ; but other causes sometimes produce it. Those species which have several broods in the year, —such as the Nettle Tortoise-shell Butterfly, are hatched in a few days after they are laid ; but should the female lay late in the autumn, the eggs remain in a state of hybernation till the succeeding spring. That this condition and difference are attributable to the influence of temperature, has been proved by numerous experiments. These late laid eggs may be hatched by placing them in the temperature of summer heat. The Silkworm is never hatched till six weeks after its extrusion. However, by artificial means, the ordinary laws of nature may be altered ; for in countries where they are much propagated on account of the silk, it is the practice for women

to hatch them in less than a month, by carrying the eggs in their bosoms.

Kirby and Spence assert, that "to retard their hatching with particular views is in any circumstances impossible. When the heat of the atmosphere has reached a certain point, the hatching cannot be retarded by cellars; and M. Faujas has remarked, that in time the Silkworm's eggs would hatch in an ice-house." *

Contrary to the above assertion, in one instance,—and indeed the only time I ever tried the experiment,—I found that, by placing the eggs of a Silkworm Moth in a cold damp cellar, they were kept from hatching from the year 1818 till the year 1820, when they were exposed to the sun's heat, which speedily brought them to the larva state. Young, in his *History of France*, states, that no art will hatch the eggs of the common Silkworms the first year, or that in which they are laid; but that there is a species brought from Persia, which are hatched three times a-year, and which will break from the egg in fifteen days, under a proper temperature. But it is stated, as a circumstance out of the ordinary laws of Nature, that in the year 1765, the common sort hatched in the first year.

In some species, the caterpillar is some hours in extricating itself from the shell at hatching. In the

* *Introduction to Entomology*, iii. p. 102.

instance of the *Satyrus macra*, *Saturnia pavonia*, and various others, the shells are furnished with a little lid, which, when the larva is completely developed, it can force up, and emerge at pleasure.*

One of the most remarkable circumstances connected with the eggs of insects, is, their great specific gravity. From all the experiments which have been made, it has been found that they sink rapidly in water. This has been the case from the largest which has been tried, namely, those of the Drinker Moth, (*Odonestis Potatoria*,) which is almost the size of a hempseed, to that of the rose plant, *Aphis*, which is hardly visible to the naked eye. But the eggs of the Gipsy Moth float, in consequence of their being covered with down.

* BRAHAM, 249. ROSEL. iv. 130.

CHAPTER II.

OF THE LARVA, OR CATERPILLAR STATE.

THE second, or larva state, is that condition of the animal which follows its exclusion from the egg. The Caterpillar is soft, without wings, and usually of an oblong shape, differing, however, very considerably in the various species. The lower figure of Plate I. represents the larva of the Peacock Butterfly, (*Papilio Io.*)

The word *larva* (which, in Latin, signifies a mask,) was adopted by Linnæus, because he considered that the real insect, while in the caterpillar state, was under a mask. In the English language caterpillar is the term employed for the grub of the butterfly in this condition.

The larvæ of butterflies are extremely small at first, when they issue from the egg, but they grow rapidly, and to a great size in proportion to their original bulk. The larva of the Goat Moth, (*Cossus ligniperda*,) when it has arrived at its full size, is seventy-two thousand times heavier than when it emerges from the egg; and the maggot of the Blue Fly is, in twenty-four hours, one hundred and fifty-five times heavier than at its birth.

Caterpillars have sixteen legs, and devour their food by means of two jaws; they have twelve eyes, so exceedingly minute, as to be nearly imperceptible without the aid of a microscope.

The quantity of food which is daily eaten by a caterpillar is surprising, being greatly more in proportion to its bulk than is consumed by any other animal. Many larvæ eat twice their own weight of leaves within twenty-four hours. John Hunter assigned as a cause, that their stomachs have not the power of dissolving vegetable matters, but merely the faculty of extracting a juice from them.* This seems indisputable from the fæces, consisting of coiled up hardened particles of leaves, which, after being immersed in water, will expand like tea leaves. The quantity, also, in proportion to the mass consumed, is farther confirmation of the fact. Colonel Marshall made some detailed experiments, and found that the larva of the *Bombyx Caja*, which weighed thirty-six grains, voided every twelve hours from fifteen to eighteen grains weight of excrement; while it only increased in weight during that time from one to two grains. While in this condition they generally eat voraciously, and repose but for short intervals. As they enlarge, which they do very rapidly, they cast their skins several times. When the larva has attained its full size, it soon afterwards ceases to eat, becomes excessively restless, and searches for a place,

* *Observations on the Animal Economy*, p. 221.

fitted to its nature, to which it may retire for the purpose of being transformed from one state of existence to another. It spins some silky filaments, generally attached to the under side of flowers, the crevice of a wall, or such safe retreat ; and again its skin separates from the body, exhibiting the animal in its third condition. This Linnæus called the pupa.

When we know the astonishing numbers of eggs produced by various species of lepidopterous insects, we may wonder what becomes of them, for we see few, comparatively, of the perfect insects to these eggs, or even to the caterpillars of some species we meet with. The Creator of all things has, in his wisdom, checked the progress of these destructive larvæ, by forming a genus of insects to prey upon them, diminutive in their size when compared to the caterpillars. These are termed *Ichneumons* by Linnæus, and *Microgaster* by the celebrated French entomologist Latreille. Professor Rennie, in treating of these little *destructors*, says, “ It must have occurred to the least attentive observer of the Cabbage Butterfly, (*Pontia brassica*,) that when it ceases to feed, and leaves its natural cabbage to creep up walls and palings, it is often transformed into a group of little balls of silk, of a fine texture, and a beautiful canary yellow colour ; from each of which there issues, in process of time, a small four-winged fly, (*Microgaster glomoratus spinola*,) of a black colour, except the legs, which are yellow. By

breeding these flies in a state of confinement, and introducing to them some Cabbage Caterpillars, their proceedings in depositing their eggs may be observed. We have more than once seen one of these little flies select a Caterpillar, and perch upon its back, holding her ovipositor ready brandished to plunge between the rings, which she seems to prefer. When she has thus begun laying her eggs, she does not readily take alarm; but, as Reaumur justly remarks, will permit an observer to approach her with a magnifying glass of a very short focus. Having deposited one egg, she withdraws her ovipositor, and again plunges it, with another egg, into a different part of the body of the caterpillar, till she has laid in all about thirty eggs. It is not a little remarkable, that the poor caterpillar, whose body is thus pierced with so many wounds, seems to bear it very patiently, and does not turn upon the fly, as he would be certain to do upon another caterpillar, should it venture to pinch him, a circumstance by no means unusual. Sometimes, indeed, he gives a slight jerk; but the fly does not appear to be at all incommoded by the intimation that her presence is disagreeable.

“The eggs, it may be remarked, are thrust sufficiently deep to prevent their being thrown off when the caterpillar changes its skin; and being in due time hatched, the grubs feed in concert on the living body of the caterpillar. The most wonderful cir-

cumstance, indeed, of the whole phenomenon, is the instinct with which the grubs are evidently guided to avoid devouring any vital part, so that they may not kill the caterpillar, as in that case it would be useless to them for food. When full grown, they even eat their way through the skin of the caterpillar without killing it, though it generally dies in a few days, without moving far from the place where the grubs have spun their group of silken cocoons in which to pass the winter." *

THE EGGS AND THE LARVA OF THE MICROGASTER GLOMORATUS.

Fig. 3. the eggs, natural size ; Fig. 1. larva, natural size :
Fig. 2. the larva magnified.



THE PUPA OF THE MICROGASTER GLOMORATUS.

Fig. 1. size of life ; Fig. 2. magnified.



* *Insect Transformations*, p. 61.

THE MICROGASTER GLOMORATUS.

Size of life.



The cocoon in which the pupa of these little animals are destined to remain for a time, is furnished with a distinct lid. This moves on a sort of hinge, which the perfect insect has the power of forcing open, to escape from its confinement, after it is transformed from the pupa envelope.

COCOON OF THE MICROGASTER GLOMORATUS.

Fig. 1. natural size ; Fig. 2. magnified.



Besides the larva of the Cabbage Butterfly, many others are liable to be preyed upon by parasites, similar to the *Microgaster glomoratus*. The collectors of lepidopterous insects are often greatly disappointed in consequence ; for, when they have gathered the caterpillars of some fine butterflies, moths, or sphinges, which they have fed with care, and seen transformed into chrysalides, from which they expect Butterflies to emerge in the most perfect condition, they find in their stead a numerous brood of these minute insects.

The Rev. Mr Bree says, " I once fed in confinement a caterpillar of the Large Egger Moth, (*Lasiocampa Quercus* of Stephens,) which, after having spun its cocoon, and changed to a pupa, in due time produced a host of small Ichneumons, with long ovipositors, somewhat resembling the *Ichneumon manifestator* in miniature." *

The early entomologists of this, as well as of other countries, were greatly puzzled to account for the generation of these minute parasites. Joannes Goedart, in allusion to the *Microgaster glomoratus*, and another species, speaks of them as being " wonderful things, nay, scarcely credible or before heard of;" and, in reference to the second, he says, "These things I have myself found by experience, and observed not without astonishment; because it seems beside, nay, contrary to, the usual course of Nature, that, from one and the same animal, an offspring of a different species should be generated; and that one and the same creature should procreate in three different ways, which yet is manifestly the case with these caterpillars, from what I have briefly related."† Goedart alludes to the two species of Ichneumon and the Cabbage Butterfly, being all produced, as he supposed, from the pupæ of these insects.

* LOUDON'S *Magazine of Nat. Hist.* v. p. 106. For an interesting account of these parasite insects, see *Insect Transformations*, p. 55, 58.

† GEODARTII, *Metamorphoses Exper.* xl. †.

CHAPTER III.

OF THE PUPA, OR CHRYSALIS STATE.

FROM the resemblance of the animal in this condition to a mummy, or a child swathed in close trusses, which is a practice of many of the northern nations, particularly the Laplanders, Linnæus gave the chrysalis the name of *Pupa*.

THE PUPA OF THE PEACOCK BUTTERFLY.

Plate 1.—Upper Figure.

OTHER terms used for this state are the *Chrysalis*, and the *Aurelia*; the former from a Greek word, and the latter from a Latin word. Various species of lepidopterous insects, previous to this condition, spin for themselves a casement of silky filaments, which naturalists term the *Cocoon*. In this envelope they lie concealed, until their final change.

After remaining for some months in the pupa condition, the skin or casement bursts, and the creature then emerges in its perfect or *Imago* state. This term was employed by Linnæus, from its having laid aside its mask, or swaddling clothes, and become a true image of its species.

Butterflies, in their perfect form, have only six feet, ten of those with which it was furnished in its caterpillar state having disappeared. The jaws, also, are lost, and replaced by a curled-up proboscis, incapable of mastication, and only suited for extracting the liquid sweets from flowers. The head is totally changed in form; and it has acquired four wings, to enable it to make rapid and extensive aerial flights. Two long horns project from the upper part of its head, and its twelve eyes are replaced by two, which are composed of at least twenty thousand convex lenses, each supposed to possess distinct and effective vision.

The internal change of structure is no less astonishing than that which is presented externally. In the caterpillar, there are some thousands of muscles, which are replaced in the *Imago* by others of a form and structure entirely different. Almost the whole body of the caterpillar is occupied by a capacious stomach. In the butterfly, this changes into an almost imperceptible thread-like process; and the abdomen is inflated by two large packets of eggs, or other organs, which are not visible in its former con-

dition. The caterpillar has two spirally convoluted tubes filled with a silky gum, but in the butterfly both these have nearly disappeared; and equally wonderful changes have taken place in the structure and dispositions of the nerves and other organic processes.

Such are the extraordinary metamorphoses to which this animal is subject. It will be observed, that the change from the one form to the other was not direct, and that a distinct, and not less singular state intervened. After casting its skin several times, and even parting with its jaws, and at length, progressing in bulk, and attaining its full growth, the caterpillar attaches itself to a leaf by a silken filament. In this condition its body becomes much contracted; its skin splits once more, and discloses a uniform mass, without exterior eyes, mouth, or limbs, and exhibiting no appearance of life except when touched, in which case it gives indications of existence by a slight motion. In this deathlike casement, in a state of torpor, it remains for months without food. The casement at length bursts, and although not longer than an inch, and in diameter a quarter of an inch, a butterfly springs into existence of dimensions extraordinary, covering a surface of nearly four inches square.

Butterflies and moths, while in the pupa state, are enclosed in a membranous skin, with their legs, antennæ, and wings, closely folded over their breast

and sides. The whole body is enclosed in an external case or covering, of a horny consistence, which prevents the organs beneath from being so distinctly seen through, as may be observed in many other species of insects. These pupæ are often tinged with gold : hence the Roman name *aurelia*, and the Greek term *chrysalides*. These terms have now been converted into English words, and, more general in their application, signify all pupæ, whether gilded or not.

For general convenience, chrysalises may be divided into two great classes ; namely, those devoid of angular projections, and those having such projections. Each of these present a variety of forms, and possess peculiar characters.

The first, or *angular* pupæ, are confined to Butterflies ; in some of which the head projects into one short conical protuberance, as in the chrysalis of the common Cabbage Butterfly, and those species to which it is allied ; others project into a horn ; in a third, the head is armed with conical eminences ; some few have nose-shaped prominences.

The second, or *conical*, include the nocturnal lepidoptera, such as Moths, &c. They are without protuberances, and subject to less variety of form. Exceptions, however, present themselves in the Goat Moth, and Orange-tip Butterfly : the former having two points on the head, while the latter is distinguished by a fusiform process from the head and tail.

CHAPTER IV.

OF THE SENSES OF LEPIDOPTEROUS INSECTS.

THE order *lepidoptera* includes Butterflies, Sphinges, and Moths. The name of this order was given by Linnæus from the mealy scales with which the wings are covered.

There is much difficulty in determining the different organs by which the senses of insects are manifested. This arises from the great physical differences which exist between vertebral warm-blooded animals, and those lower orders of creation without bones, and having cold blood ; so that little can be drawn from analogy. The subject, therefore, is still in much obscurity, notwithstanding the patient investigations of Fabricius, Müller, Wollaston, Kirby, Spence, and Rennie.

OF TOUCH.

MOST naturalists are now of opinion, that the organs of touch, in insects in general, are the antennæ and palpi, or what have usually been called the feelers.

Cuvier and Dumeril think that the palpi of insects are the organs of touch. While in search of food, these are used to try every object which they meet with. When walking, they are used to feel the ground ; while they answer the purpose of hands in the scorpion tribe, and sometimes as feet by the spiders. Professor Rennie is of opinion, that an important organ of touch in insects, which has been altogether overlooked by naturalists, is the surface of the wings, being minutely furnished with nerves, which appear to him expressly formed for that purpose.* He says, —“ It must be this, indeed, which in a great measure serves to direct their flight, as the focus of the eyes appears, according to our ideas of senses, to be too short for the purpose.” The impulses of the atmosphere on the delicate and sensitive organs, may, in a great measure, assist, but certainly the eyes are the organs by which they direct their course.

In illustration of this doctrine, the Professor observes,—“ We remarked, for several weeks, near St Adresse, in Normandy, a very limited spot, close by the sea, to be daily frequented by about half a dozen of the Clouded Yellow Butterfly, (*Colias Edusa*, Stephens,) which seemed to make a regular circuit, and return again, altogether independent of the direction of the wind, against which they often made way. Now, as they rose to so considerable a height, that they must have lost sight of the ground,

* *Insect Miscellanies*, p. 12.

we conclude, that they guided their flight more by the weight of the superincumbent air, than by the direction of the wind,—an inference rendered more probable, by their never being seen on the heights, which there rise steeply from the shore." *

We are well aware, that the wings of bats are analogous to the human hand, but possess a degree of feeling much more exquisite than that organ in man. For it is certainly by the nervous sensibility of their wings that they are enabled to avoid flying against walls, trees, and other objects, in the dark. Moths possess this faculty, but in a degree not so perfect as bats. It is a well known fact, that all insects are extremely sensible of any atmospheric change, and that when it is in an electrified state, they retire to some sequestered retreat. This is especially the practice with butterflies, moths, and sphinges.

"The excellence of the sense of touch in many insects," says Dr Darwin, "seems to have given them wonderful ingenuity, so as to equal or even excel mankind in some of their arts and discoveries." He has beautifully illustrated this in his *Temple of Nature*.

The wasp, fine architect, surrounds his domes
With paper foliage, and suspends his combs ;
Secured from frost, the bee industrious dwells,
And fills for winter all her waxen cells ;

* *Insect Miscellanies*, p. 12.

The linning spider, with adhesive line,
 Weaves his firm net immeasurably fine ;
 The wren, when embryo eggs her cares engross,
 Seeks the soft down, and lines the cradling moss ;
 Conscious of change, the silkworm nymphs begin,
 Attach'd to leaves, their gluten-threads to spin,
 Then, round and round they weave their circling head-,
 Sphere within sphere, and form their silken beds.—
 Say, did these fine volutions first commence
 From clear ideas of the tangent sense ?
 From sires to sons by imitation caught,
 Or in dumb language by tradition taught ?
 Or did they rise in some primeval site
 Of larva-gnat, or microscopic mite ;
 And, with instinctive foresight, still await
 On each vicissitude of insect state ?—
 Wise to the present, nor to future blind,
 They link the reasoning reptile to mankind !—
 Stoop, selfish Pride ! survey thy kindred forms—
 Thy brother emmets and thy sister worms ! *

OF TASTE.

As in the sense of touch, analogy leaves us no grounds for supporting the doctrine of taste in insects ; for if the physiological distinctions in the higher animals were held up as tests, then it might be inferred, *a priori*, that insects had no taste ; for in place of the organs being soft, moist, and furnished with innumerable papillæ, their tongues are rigid, dry, and hard. There, however, can be but little doubt that they do enjoy this sense in a considerable degree.

* DARWIN'S *Temple of Nature*, p. 119.

from the fact that they are very particular in the choice of their food ; and most of the butterfly tribe, while in their various conditions, will feed only on the plant on which they were brought into existence, or when in a perfect state, on the nectar of flowers.

Last autumn, a box and several flowerpots, with mignonette, was covered with numerous caterpillars of the *Papilio rhamni*. I took many of these off, and put them into a tumbler, to feed and watch their progress as to growth and time of transformation. Wishing to ascertain whether or not they would feed on any other plants than that on which they had been hatched, I allowed them to consume all the leaves, and when I supposed them very hungry, supplied them abundantly with lettuce, sour dock, and other vegetables ; but they refused them all, preferring to gnaw and totally consume the epidermis of the dry stalks, rather than take the proffered food, which, it would appear, was not their native aliment, and they would have died rather than taste any other. The moment that leaves of mignonette were introduced, they speedily found them out, and greedily devoured them.

De Geer remarked the same thing ; for he found that the larva of a *Papilio*, which inhabited both the sallow and poplar, would feed only on the trees on which they were hatched ; for those produced on the sallow would rather die than eat the poplar.

while those propagated on the poplar would not eat the leaves of the willow.

It is well known that the Antler Moth,* which devours a considerable variety of grasses, and that to such an extent as almost totally to consume some of the richest pastures of Sweden, is nevertheless so fastidious in its taste, as to reject most scrupulously the fox-tail grass, which in flavour so nearly resembles other grasses on which it feeds, that the most sensitive palate of man is incapable of distinguishing the difference. The larva of the Ringlet Butterfly† will only feed on the poa;‡ and the Gate-keeper§ abstains from all other food but the dog's-tail grass.||

If we judge from circumstances, the taste in bees does not seem very perfect; “for,” says the elder Huber, “contrary to the received opinion, they display little choice in collecting honey; nor do they testify greater nicety in the quality of the water which they drink, as the most corrupted marshes and ditches seem to be preferred to the most limpid streams, nay, even to dew itself. Nothing, therefore, is more unequal than the quality of honey, the produce of one district differing from another, and the honey of spring being unlike that of autumn.”

* *Charæa Graminis* of Stephens.

† *Hipparchia Hyperanthus* of Fabricius.

‡ *Poa annua*.

§ *Hipparchia pamphilus*.

|| *Cynocerus cristatus*.

Although insects appear to have dry, rigid mouths, yet they possess the salivary glands, which are necessary for moistening their food, and fitting it for mastication. Professor Rennie has recently made some conclusive experiments on this interesting subject. He says, "one of the circumstances that first awakened our curiosity with regard to insects, was the manner in which a fly contrives to suck up, through its narrow sucker, (or *haustellum*,) a bit of dry lump sugar; for the small crystals are not only unfitted to pass, from their angularity, but adhere too firmly together to be separated by any force the insect can exert. Eager to solve the difficulty—for there could be no doubt of the fly's sucking the dry sugar—we watched its proceedings with no little attention; but it was not till we fell upon the device of placing some sugar on the outside of a window, while we looked through a magnifying glass on the inside, that we had the satisfaction of repeatedly witnessing a fly let fall a drop of fluid upon the sugar, in order to melt it, and thereby render it fit to be sucked up,—on precisely the same principle that we moisten with saliva, in the process of mastication, a mouthful of dry bread, to fit it for being swallowed,—the action of the jaws, by a beautiful contrivance of Providence, pressing the moisture along the channels at the time it is most wanted."

To the investigations of Swammerdam, we are indebted for our first knowledge of these vessels.

He observed them in the small Nettle Tortoise-shell Butterfly; but he was unable to trace their termination; and cautiously observes, "What the office of these vessels is, and whether they may not be salivary ducts, I cannot take upon me to determine."* That naturalist, as well as Ramdohr, was inclined to suppose these the silk reservoirs; but that they were not was proved by Lyonnet, who detected a conspicuous pair of salivary ducts in the larva of the Goat Moth;† and in his investigations, he is borne out by the dissections which were afterwards made by Heroldt, in his minute and satisfactory anatomy of the Cabbage Butterfly.

Butterflies, in their mature state, have but little fluid matter in them; and, besides, being so much exposed to the scorching rays of the sun, in which they are continually sporting, are liable to great thirst. They are often, therefore, to be seen in the act of drinking by the sides of pools of water; particularly in the sultry autumnal months. Mr Rennie says, "At Compton Bassett, in Wiltshire, I once counted about fifty of the small White Butterfly (*Pontia Rapæ*, of Haworth) all assembled within a space of a few yards on the sludge which had just been left by the water of a pond, partially dried up by the sun. What was most remarkable, they

* *Book of Nature*, Part ii. p. 21.

† *Traité Anatomique*, p. 112.

seemed to have quite lost the pugnacious disposition which they were affirmed to display when they meet with their congeners on the wing. At the pond, on the contrary, all was harmony among these light winged belligerents, no one disturbing its neighbour, though they stood side by side, and almost touching one another. They were, indeed, too intent on quenching their thirst to think of attack or defence. We remarked, in the autumn of 1829, a similar congregation of the same species of butterfly on the watered roads in the vicinity of London. They do not seem to be more choice in the quality of their water than bees, who, most naturalists tell us, prefer that which is stagnant and putrescent."*

It is remarkable that some insects feed upon substances which are poisonous to other animals; for example, the caterpillar of the *Papilio cupido* feeds on the leaves of tobacco, which proves a deadly poison to most of the mammiferous animals, and is even destructive to many of the insect tribes.

OF SMELL.

THERE can be little doubt that the sense of smell is enjoyed by most insects in a high degree of perfection. Mr Rennie remarked, that, in a narrow garden, enclosed with stone walls, about fifteen feet high, at Havre de Grace, every butterfly which

† REAUMUR, v. p. 697.

passed over it was sure to visit the blossoms of an Alpine blue nettle, (the *Centaurea montanea*.) This is the more remarkable, as that flower is known to have but little effect on the olfactory nerves of the human species. Now, these butterflies were alive to its odour at upwards of twenty feet. This fact is the more striking, as the odours of flowers are said by M. Le Chat to be much heavier than atmospheric air, and therefore but seldom rise in it. We have ascertained this to be true, from the circumstance, that mignonette, although possessing a powerful odour, and planted close to a building, can be but faintly, if at all, perceived from a window one story high ; although, on going to the surface of the earth, we find the atmosphere surcharged with its fragrance at the distance even of from fifty to an hundred yards. Mr Rennie remarked that even the Painted Lady Butterfly, (*Cynthia cardui*,) which always flies at a considerable height, alighted on the plants above mentioned, thus proving that their perception of odours is very acute.

It is a practice with collectors to entrap the large Tortoise-shell Butterfly, (*Vanessa polychlorus*,) by spreading honey on the leaves of a tree which they are in the habit of frequenting.

There is great difficulty in determining by what means the organ of smell in insects manifests itself ; for, as they do not breathe like quadrupeds, or other warm-blooded animals, by the mouth, but by an in-

numerable number of spiracles along each side of their bodies, where then can this organ be situated? The theory of smell in the higher animals is, that it is felt by a current of air which is impregnated with odoriferous particles passing through a moistened channel. This was first most ably described by Schneider, nearly two centuries ago.* Reasoning from analogy, we would say that insects enjoy this sense by the same process. Hence Baster, Cuvier, Dumeril, and Lehmann, are of opinion, that insects perceive odours by means of their breathing holes.

Blainville says the antennæ are the organs of smell. He is of opinion that the modification of the skin with which they are invested, is in general olfactory only in a small degree; this power appearing to be more acute in the thickest parts of the organs, where it is more soft and tender. A difficulty to the establishment of this theory is, that spiders have no antennæ, consequently do not possess this sense, if his doctrine were true. Latreille entertains the same opinion; "for," says he, "the exercise of smell consists only of the action of the air impregnated with odoriferous particles on the nervous, or olfactory membrane, which transmits the sensation. If insects are really endowed with an organ furnished with similar nerves, and with which air, charged with odoriferous particles, comes in contact, such an

* *De Sensu ac Organo Odoratus.* Witteb. 1655.

organ may be regarded as that of smell. Should, therefore, the antennæ present a tissue of many nerves, what inconvenience can take place from supposing this tissue the medium of transmitting odours? Would not this hypothesis, on the contrary, be more simple and more consonant to anatomical principles, than that which fixes the seat of smell at the entrance of the stigmata?"

Mr Kirby, however, mentions one observation he made in his description of the Long-horned Bee, (*Eucera*.) "A singular circumstance distinguishes their antennæ, which, to the best of my knowledge, has never been before noticed, and which may possibly lead to the discovery of the use of these organs. Placed under a powerful magnifier, the last ten joints appear to be composed of innumerable hexagons, similar to those of which the eyes of insects consist." Mr Rennie, in alluding to this fact, says, "If we reason from analogy, this remarkable circumstance will lead us to conjecture, that the sense, of which this part so essential to insects is the organ, may bear some relation to that conveyed by the eyes. As they are furnished with no instrument for preserving and communicating the impressions of sound similar to the ear, that deficiency may be supplied by extraordinary means of vision. That the stigmata are of this description seems very probable; and the antennæ may, in some degree, answer a similar purpose: the circumstance just mentioned

furnishes some presumption that they do this, at least, in the case of the males ; else why do they exhibit that peculiar structure which distinguishes the real eyes?"*

Huber's experiments seem to go far to establish a different theory. He says, " Let us now inquire into the state or organ of this sense, whose existence has been so well established.

" Nostrils have not yet been recognised in insects ; nor do we know in what part of the body they, or any other organs corresponding to them, are placed. Probably odours reach the sensorium through the medium of a mechanism similar to our own,—that is, the air is introduced into some opening at the termination of the olfactory nerves ; and hence we should examine if the stigmata† do not perform this function, or whether the organ we are in quest of be not situated in the head, or in some other part of the body. With the view of elucidating the matter, we made the following experiments :—

" 1. A pencil dipped in oil of turpentine—one of the substances most disliked by insects—was presented successively to all parts of the body of a bee, which did not appear in the least affected, whether

* *Insect Miscellany*, p. 63.

† Certain apertures, generally called stigmata, appear on each side of the body of insects, which naturalists believe to be appropriated exclusively to respiration.

on approaching the thorax, abdomen, or stigmata of the thorax. 2. We then took a fine pencil, that it might reach every point of the head, and brought it near the antennæ, the eyes, and protruded trunk of a bee in the act of feeding, but without producing the least effect. It was otherwise on carrying it near the cavity of the mouth, above the insertion of the proboscis. At that instant the bee receded, left the honey, and, beating its wings, while moving about in much agitation, it would have taken flight had not the pencil been withdrawn. Having renewed its repast, we resumed the application, always carrying the impregnated portion near the mouth. The bee, now quitting the honey, fixed upon the table, and fanned itself during some minutes. The organ of smelling, therefore, seems to reside in the mouth itself, or in the parts contiguous.

“ Bees not occupied in feeding appeared more sensible of the odour of the turpentine. They were affected by it at a greater distance, and speedily took flight, whereas, when so engaged with the trunk immersed in honey, several parts of the body might be touched by the pencil without their withdrawing. We inferred that their attention was either absorbed by the smell of the honey, or their organs less exposed to the effluvia. This could be ascertained in two ways,—either by covering all parts of the body with a varnish, and leaving the sensible organ free; or allowing the whole parts to remain untouched,

excepting that in which the sense of smell was supposed to reside.

“ The latter method appearing the more practicable and decisive, we seized several bees, and, compelling them to unfold the trunk, filled the mouth nearly with flour paste. When this was dry enough, so that they could not rub it off, they were released, and none seemed to suffer any inconvenience from it. They breathed and moved with the same facility as their companions. Honey, however, did not attract them, as they neither approached it, nor were they affected by odours which, in other cases, are offensive to them. Pencils were dipped in the oil of turpentine and cloves, in ether, in fixed and volatile alkalis, and their points insinuated very near their mouth. But the odour of these fluids, which would have occasioned a sudden shock to bees in their natural state, had no sensible effect on them. On the contrary, several mounted on the impregnated pencils, and traversed them with impunity : therefore, we held that their sense of smelling was obstructed by the paste put into their mouths.” *

Humboldt is of opinion, that different parts of the body, in the various orders of insects, are adapted to the purpose of conveying to their sensorium the odours of substances.

* HUBER on *Bees*. Edinburgh Translation, (Third Edition,) 1821, p. 162—164.

Kirby and Spence, following up the experiments of Huber, say that the olfactory sensation is conveyed by "the extremity of the nose, between it and the upper lip, or under those parts;" and that it is analogous to this sense in mammiferous animals; and conceive that no one can look on an insect without coming to this conclusion.* But as we are not furnished with any experiments by which we are to prove that insects breathe at all through their head, we are at a loss how to account for the conviction of these authors. And being still so imperfectly acquainted with this part of the insect economy, we must leave it to be decided by future investigations. If, however, the conclusions of Dr Rousseau be correct,—that without the sense of smelling, we could have no taste, then it appears pretty evident that there must be spiracles in the mouths of insects, by which smell is conveyed to the sensorium.

Rousseau made some experiments on the human species, by which, we think, he was fully warranted in adopting his theory. He successively blindfolded some young medical students, who were sceptical regarding his opinion, and after effectually stopping their nostrils, gave them onions to eat, which they took for apples, and they supposed camphor to be bread.

* KIRBY and SPENCE, *Introduction to Entomology*, iv. p. 256.

OF HEARING.

Naturalists are much divided in opinion regarding the organs of hearing in insects, and many maintain that they are insensible to sounds. The antennæ, by some, are supposed to correspond to the ears of other animals, but as yet no satisfactory proofs have been discovered to warrant this conclusion.

It is well known that insects emit various sounds ; but whether these are heard by their congeners, is still matter of dispute. We can, however, conceive, that if these sounds are not heard, in the strict sense of the word, yet it is quite possible that they may be perceived by the impulses they produce on the atmosphere through the medium of the antennæ, or other organs, which may possess an exquisite sensibility in this respect.

After an attentive perusal of all which has been written on this subject, we are quite unable to venture even an opinion ; and it would only be a waste of time to adduce all the arguments which have been held on both sides of the question.

OF VISION.

Much difference of opinion exists among naturalists, regarding the extent of vision in insects. In the instance of bees, Huber says,—“ How great is the perfection of their organ of sight !—Since, from a distance, the bee recognises its habitation, amidst an

apiary of numerous others resembling it, and returns in a straight line with great velocity, we must suppose that it is distinguished by marks escaping our notice. The bee departs, and flies straight to the most flowery field. Having ascertained its course, it is seen traversing it directly, as the flight of a cannon or musket ball. Its collection being made, it rises aloft in the air, to reconnoitre its hive ; and returns with the rapidity of lightning." *

On this subject, very opposite opinions prevail ; for Wildman maintains, that he has observed bees searching for the door of their hive, and frequently been obliged to rise in the air again, in order to find it. This, according to the views of Dr Bevan, is, because they see objects at a distance better than those that are near, from the contraction of their eyes. The experiments of Dr Evans and Sir G. S. Mackenzie, both tend to support Wildman's views.

We are yet but imperfectly acquainted with the vision of insects ; and, from the great variety in the construction of their eyes, it is no wonder we should be so. For example, a centipede has twenty eyes, a spider has eight, and a butterfly and its congeners but two ; but these two have thirty-five thousand facets in each. It may, therefore, seem remarkable, how they see but one object ; but it is not a more difficult question, than how we see but one object with two eyes.

* HUBER *on Bees*, Edinburgh Edition, p. 255.

When the facettèd eye of a butterfly is examined a little closely, it will be found to have the appearance of a multiplying glass, the sides, or facets, nearly resembling a brilliant cut diamond.

In the experiments performed by Mr Herschel, he describes the impulses received by the eyes of insects as analogous to those of sound, as given by Wollaston. He says,—“ Although any kind of impulse or motions, regulated by any law, may be transferred from a molecule in an elastic medium ; yet in the undulating theory of light, it is supposed that only such primary impulses as occur according to regular periodical laws, at equal intervals of time, and repeated many times in succession, can affect our organs with the sensation of light. To put in motion the molecules of the nerves of our retina with sufficient efficacy, it is necessary that the almost infinitely minute impulse of the adjacent ethereal molecules should be often and regularly repeated, so as to multiply, and, as it were, concentrate their effect. Thus, as a great pendulum may be set in swing by a very minute force often applied, at intervals exactly equal to its time of oscillation ; or, as one elastic solid body can be set in vibration, by the vibration of another at a distance, propagated through the air, if in exact unison ; even so may we conceive the gross fibres of the nerves of the retina to be thrown into motion, by the continual repetition of the ethereal pulses ; and such only will be thus agitated, as from

their size, shape, or elasticity, are susceptible of vibrating in times exactly equal to those at which the impulses are repeated. Thus, it is easy to conceive how the limits of visible colour may be established ; for, if there be no nervous fibres in unison with vibrations, more or less frequent than certain limits, such vibrations, though they reach the retina, will produce no sensation. Thus, too, a single impulse, or an irregularly repeated one, produces no light ; and thus, also, may the vibrations excited in the retina continue a sensible time after the exciting cause has ceased, prolonging the sensation of light, (especially of a vivid one,) for an instant in the eye. We may thus conceive the possibility of other animals, such as insects, incapable of being affected with any of our colours, and, receiving their whole stock of luminous impressions from a class of vibrations altogether beyond our limits, as Dr Wollaston has ingeniously imagined, (we may almost say, proved,) to be the case with the perceptions of sound." *

PAIRING OF LEPIDOPTEROUS INSECTS.

IN almost all insects, there is great variety in the colour of the males and females ; and in many they are so different in form, as to be taken for different species.

In butterflies, the males are usually of a brighter

* *Encyclopædia Metropolitana*, Article LIGHT.

colour than the females, and, not unfrequently, of totally different colours. Want of experience in this department, led the great Linnæus into an egregious blunder; for he considered them not only specifically distinct, but also as belonging to different families. His divisions of Trojans and Grecians is, in many instances, liable to this objection. The male Brimstone Butterfly, (*Gonepteryx Rhamni*,) is of a beautiful sulphur yellow; while the female is of a dirty greenish white. In the Orange-tip Butterfly, (*Pontia cardamines*,) so named from the fine orange spot towards the points of its superior wings, the spot is possessed by the male only. The male Argus Butterfly, (*Polyommatus argus*,) has the upper surface of the superior wings of a dark mazareen blue; while those of the female are of a deep brownish purple.

The female butterflies are less frequently to be seen than the males, as they conceal themselves in some quiet retreat. In these situations, they are supposed to be discovered by the sense of smell in the males, which can be accomplished at a great distance. This has long been known to British entomologists. For we find, by the writings of Barbut and Moses Harris, that they were aware of this fact, and practised a mode of catching the males, which they termed *sembling*, from possessing a female of the species in confinement. Haworth says, "It is a frequent practice with the London Aurelians, when

they breed a female of the Lappit Moth, (*Gastropacha Quercifolia*,) and some other day flying species, to take her in a box with a gauze lid into the vicinity of the woods, where, if the weather be favourable, she never fails to attract a numerous train of males, whose only business appears to be an incessant, rapid, and undulating flight in search of the females. One of these is no sooner discovered, than they become so much enamoured of their fair kinswoman, as absolutely to lose all fear for their own personal safety, which, at other times, is effectually secured by the reiterated evolutions of their strong and rapid wings. So fearless, indeed, have I beheld them on these occasions, as to climb up and down the sides of the cage which contained the dear object of their eager pursuit, in exactly the same manner as Honey Bees which have lost themselves, climb up and down the glasses of a window."

After the butterflies, sphinges, and moths, have arrived at their perfect, or imago condition, their whole business seems to be the fulfilment of that universal law of nature, the reproduction of their kind. This is prettily told by Darwin, in the following lines:—

Hence, when the morus,* in Italia's lands,
To spring's warm leaves its timid leaf expands,
The silkworm broods in countless tribes above
Crop the green treasure, uninform'd of love;

* The mulberry-tree.

Erewhile the changeful worm, with circling head,
Weaves the nice curtains of his silken bed ;
Web within web involves his larva form,
Alike secured from sunshine and from storm ;
For twelve long days he dreams of blossom'd groves,
Untasted honey, and ideal loves,
Wakes from his trance, alarm'd with young desire,
Finds his new sex, and feels ecstatic fire ;
From flower to flower, with honey'd lips he springs,
And seeks his velvet loves on silver wings.

Mr John Henry Davies, curator of the museum of the Portsmouth Philosophical Society, has recorded some curious and satisfactory observations on the subject.* He says,—“ It has been asserted, that the males of lepidopterous insects are guided to the females by a peculiar instinct ; so that an unimpregnated female, being carried in a wire cage along the hedges and other haunts of this tribe, will attract the males of that species, so that they may be easily captured.

“ I have never had an opportunity of trying this experiment ; but the following fact, which has lately fallen under my observation, leaves me no room to doubt the correctness of the assertion, as it proves the existence, and exhibits the operation of this instinct in a very remarkable manner.

“ Being engaged in adding the British insects to

* *Zoological Journal*, vol. v. p. 142.

the collection of the Portsmouth Philosophical Society, I had procured a variety of larvæ, (the insects thus obtained being generally in a better condition than those taken by the net.) They in due time passed into the pupa; and the first which emerged, was a female *Sphinx Convolvuli*. On going into my study in the evening, I found it fluttering on the floor. On lifting it up, it ran up my coat, and several times round the collar, before I could place it in safety. I went from thence immediately into my garden, to shut some hot-bed lights, where I was occupied about ten minutes; from thence again to my study, where I found that two fine males of the *Sphinx Convolvuli* (Unicorn Hawk-moth) had, whilst in the garden, attached themselves to the collar of my coat, where the female had previously been.

“After this, another female of the same species had been produced; three males found their way into my study down the chimney, there being no other mode by which they could obtain entrance; and one of them fell into a vase standing under it, where he was captured. A few days after, two females of the *Phalœna salicis* (Satin Moths) emerged. On the same evening, I saw several of that species fluttering against the window; and, on opening it, six males rushed in, and instantly sought the females.

“I state these facts just as they occurred. They are certainly curious, and go to prove, that the females emit an odour perceptible to the delicate

olfactory organs of the males at a great distance, who, when attracted, are stimulated to overcome every obstacle in the way of the fulfilment of the great law of nature. After the female has become gratified, this effect appears to cease.

“ Precisely similar circumstances took place with the *Phalœna neustria*, (Crimson and Gold Moth,) the males presenting themselves at the window.”

Professor Rennie asserts that this does not always succeed ; for, says he, “ In the spring of 1830, we bred a female of the Lime-hawk Moth, (*Smerinthus Tilix* of Latreille,) and placed her on a small lime-tree, planted in a garden-pot, and left her at full liberty, trusting to the known stationary habits of female insects for not losing her. In this we were not deceived ; for though the tree consisted only of a single stem, of about three feet high, she never left it, remaining upon the same leaf sometimes for several days without stirring ; and when she did move, it was only to perambulate the plant, agitating her wings the while, (as she did while stationary,) with a sort of tremulous quivering, not very perceptible, unless closely inspected. It might be that there were no males in the vicinity, though the insect is by no means rare around Lee. At all events, she remained without a male for about three weeks, as the eggs, which she at length laid, proved to be infertile ; and she died soon after. In the instance of a much rarer insect, the Clear Under Wing,

(*Ægeria Asiliformis* of Stephens,) having discovered a brood in the trunk of a poplar tree, we were desirous of securing all that issued from it; and having caught a female, we placed her in a box covered with gauze, at the root of the tree,—the notion of surrounding the tree itself with gauze, not having occurred to us at the moment. As this moth is one of the day fliers, we expected to make sure of all the males in the neighbourhood; but, to our no small disappointment, not one approached the box, though we afterwards enclosed in it another female. This was the more remarkable, that, from the protrusion of the pupa cases from the tree, there was evidently not only one or two, but a considerable number evolved, after the box had been placed there. In 1818, having discovered a beautiful male Crane Fly, (*Ctenophora pectinicornis* of Meiger,) apparently just disclosed from the pupa, we carefully examined the old willow stump upon which it rested, expecting to find more of the same brood. Next day, we accordingly observed a female, and imagining it to be one of the rare species, (*Ctenophora ornata*, or *flaveolata*,) we placed her in a gauze-covered box; but no male approached for five days, when a large hunting spider found means to introduce himself into the box, and made a meal of her.

“ There is one extraordinary fact connected with this subject, which is worthy of being prominently stated, namely,—that after insects pair, and the

females deposit their eggs, they very soon die, seldom living a few days, sometimes only a few hours afterwards ; but should pairing be prevented, their lives, and particularly that of the female, may be protracted to an indefinite period. Collectors, indeed, find it is with the utmost difficulty a female can be deprived of her life before laying ; and we have no doubt, that the marvellous stories reported of the revival of flies and other insects, after long immersion in spirits, or after being crushed in shutting a book, originated in this circumstance, as well as the prolonged life of some insects, which is given on good authority." *

It is a most singular circumstance, in the case above quoted, that moths which have not met with a mate, should live so considerable a time beyond the limits ordinarily prescribed by nature ; and it would be difficult, on physiological principles, to account for it. There are also some examples of butterflies continuing their existence even for months, as may be instanced in the Peacock Butterfly, the Nettle Tortoise-shell Butterfly, and several others, which are hatched late in the autumn, and live in a torpid state till the spring, when they meet with a mate. Had these been hatched earlier in the summer, and laid their eggs, they would have died, like most of their congeners.

* *Insect Miscellany*, p. 217.

CHAPTER V.

ASSOCIATIONS AND MIGRATIONS OF LEPIDOPTEROUS INSECTS.

IN quadrupeds, birds, and fishes, there are instances of extraordinary periodical migrations, principally for the purpose of obtaining food in more abundance, when it becomes scarce, from the effects of climate or other circumstances. In insects, too, there are frequent extensive migrations, to account for which we find some difficulty. It is easy to see the reason why some species of caterpillars associate, as they, for their mutual protection, construct nests wherein to retire, both during night and in bad weather. The *Papilio Io* and *cinixia* are examples of this: the former constructs a nest like the Processionary Moth, although differing in some particulars.

Some insects associate only in their imago state; while others are gregarious in both conditions. Others, again, congregate while in their larvæ form; which, with a very few exceptions, is the case with the numerous tribe of lepidopterous insects. These are hatched together, and remain in compact, for

the purpose of rearing, by their united labour, a comfortable dwelling.

There have been instances of butterflies associating in large bodies : but for what purpose, no one has as yet been able to ascertain. We are informed by Mr Knapp, that on a calm summer day he observed a prodigious number of the *Papilio Brassicæ*, or Large Cabbage Butterfly, flying from north-east to south-east ; and so immense were their numbers, that their flight was continuous for upwards of two hours.* And Kalm relates in his *Travels*,† that he noticed this remarkable flight nearly half across the British Channel. It is recorded by Lindley, in the *Royal Military Chronicle*, that in the beginning of March 1823, in Brasil, there were prodigious flights of white and yellow butterflies, which lasted for many days successively. They were not observed to settle any where, but proceeded on their course from north-east to south-east. So direct was their line of travel, that nothing stopped them ; and their progress was towards the sea, which was not far off, where they, in all probability, would perish. It is curious, that, at the time this flight was observed, no other species could be seen ; and this is the more remarkable, as the country abounds in a variety of these insects.

“An extraordinary flight,” says Captain Adams, “ of small butterflies, with spotted wings, took place

* ROSEL'S *Amusements of Insects*, ii. 135.

† KALM'S *Travels*, p. 13.

at Annamaboo, on the Guinea Coast, after a tornado. The wind veered to the northward, and blew fresh from the land, with thick mist, which brought off from the shore so many of these insects, that for one hour the atmosphere was so filled with them, as to represent a snow storm driving past the vessel at a rapid rate, which was lying at anchor about two miles from the shore."

In the *Journal de Rouen*, we are informed that several persons testified, they had witnessed, at Sottevilles-les-Rouen, a rain of white butterflies, which fell in abundance towards the close of the day. This, no doubt, proceeded from one of these flights, and the insects, in all probability, becoming paralyzed, from mounting too high in the atmosphere.

An extensive migration, but somewhat different, was noticed in one of the Cantons of Switzerland. Madame de Meuran Wolff, and her family, who were residing at Grandson, on the Lake of Neufchâtel, one day noticed, in the garden, an immense flight of butterflies, of the species called Painted Lady, proceeding with great rapidity. They flew close together, in the same direction, from south to north: and, although repeatedly approached, they exhibited no signs of fear, nor were they diverted from their straightforward course. This extraordinary flight consisted of a column of from ten to fifteen feet in breadth, and continued, without interruption, for upwards of two hours. Although the garden was

plentifully supplied, at the time, with melliferous flowers, not a single butterfly was seen to alight, but all continued to pursue their course, in a low and equal manner. What renders this fact the more singular is, that from the moment the caterpillars of this species are hatched, they lead a solitary life; and even in their perfect, or imago condition, they are not observed to be gregarious.

Professor Bonelli of Turin, however, observed a similar flight of the same species of butterflies, in the end of the March preceding their appearance at Grandson. Their flight was directed from south to north; and their numbers were immense. At night, the flowers were literally covered with them. Towards the 29th of March, their numbers diminished: but even in June a few still continued. They have been traced from Coni, Raconni, Lusa, &c. A similar flight of butterflies is recorded at the end of last century by M. Louch, in the *Memoirs of the Academy of Turin*. During the whole season, these butterflies, as well as their larvæ, were very abundant, and more beautiful than usual.

Among the larvæ of butterflies which associate, may be particularly mentioned that of the *Papilio cinixia*. This animal may be found on the leaves of the narrow-leaved plantain, on which it feeds. They usually associate in families, amounting to about one hundred in each. By their united labour, they weave a silken tent of a pyramidal form. This contains a

variety of apartments, is always pitched over the plants on which they feed, and answers the double purpose of sheltering them from the heat of the sun, and from heavy showers of rain, neither of which is at all agreeable to their tender frames. After they have devoured all the leaves within the verge of their covering, they set to work, and construct a new one over some other roots of the same plant ; and it not unfrequently happens, that several of these encampments are within a few feet of each other. On the approach of winter, they construct a stronger tent, consisting of one apartment. When the cold weather sets in, they retire within it, roll themselves up into a sort of ball, and lie huddled together until April, when they break up their community, become solitary, and continue so, till they assume the pupa condition.

Where food is abundant, there have been many instances of papilionaceous insects performing wonderful migrations ; while others limit their excursions to a very narrow range. The Forester, (*Ino Statices* of Leach,) has been observed in vast numbers disporting on the north bank of the Serpentine, in Kensington Gardens, while not a single one was to be seen on the opposite bank, nor even in any other spot in the neighbourhood. Professor Rennie, on one occasion, observed many hundreds of the Burnet Moth, (*Anthrocera filipendulæ* of Stephens,) on the north shore of the Great Cumbrya Island, at the mouth of the Clyde, but not on any other part of the

island, nor on the opposite shore at Largs, although he made a round of the island on the same day. He also visited the Isle of Bute; but did not meet with a single specimen.

Harris says, that the Marsh Fritillary (the *Melitæ artemis* of Ochsenheimer) is so extremely local in its habits, that it seldom leaves the field on which it is bred, although hundreds of them may be seen flying low, and frequently alighting on plants. This insect was only found by him at Wilsden, near Harrow-on-the-Hill; but recent collectors have been unable to detect it there.

These local associations seem rather to be unusual to the general law which regulates the motions of lepidopterous insects; for almost the whole tribe, particularly the papilionaceous genera, seem to rove from field to field, without any fixed plan or motive.

As their wings are usually so ample, we need not wonder that the lepidopterous insects are such excellent fliers. Indeed, they seem to flit untired from flower to flower, and from field to field; impelled at one time by hunger, and another by love or maternal solicitude. The distance to which some males will fly, is truly astonishing. One of the Silkworm Moths (*Bombyx paphia* of Fabricius) is stated to travel sometimes more than a hundred miles in this way.*

The most beautiful of all the British butterflies.

* *Linnean Transactions*, vol. vii. p. 40.

the Purple Emperor, (*Papilio iris* of Linnæus,) when he makes his first appearance, fixes his throne on the summit of some lofty oak, from whence, in sunny days, unattended by his empress, who does not fly, he takes his excursions. Lanching into the air, from one of the highest twigs, he mounts often to so great a height, as to become invisible. Hence his synonymous name of the Purple Highflier. When the sun is at the meridian, his loftiest flights take place; and, about four in the afternoon, he resumes his station of repose.*

The large bodies of the Hawk Moths (*Sphinx*) are carried by wings remarkably strong, both as to nerves and texture, and their flight is proportionally rapid and direct. That of butterflies is by dipping and rising alternately, so as to form a zigzag line, with vertical angles, which the animal often describes with a skipping motion, so that each zigzag consists of smaller ones. This, doubtless, renders it more difficult for the birds to take them as they fly; and thus the male, when paired, often flits away with the female.†

* HAWORTH'S *Lepidoptera Britannica*, i. p. 19.

† KIRBY and SPENCE, ii. p. 355.

CHAPTER VI.

INDIRECT INJURIES TO MANKIND FROM BUTTERFLIES.

IT has been the will of Providence to place around man, in this sublunary world, many animals, which we shortsighted mortals cannot suppose to have been formed for his good. Among these is a host of insects, which lay waste the most valuable of our culinary vegetables, and others direct their ravages to the fairest and most delightful of our flowers.

In dry summers, the caterpillar of the common Cabbage Butterfly often proves destructive to whole gardens, consuming every thing which is green ; to prevent which, no effectual means have been devised. They feed indiscriminately on the leaves of turnips, cabbages, greens, and other plants. What vegetable can be more agreeable and wholesome than brocoli ? and how often have we seen its foliage ravaged, in the autumn, by numerous hordes of the caterpillar of the Cabbage Butterfly !

The larvæ of the *Papilio rapæ* are often found

insinuated into the bosom of the flowers of cauliflower flowers.

The caterpillar of the Hawthorn Butterfly (*Papilio crataegi* of Linnæus) was very destructive to the foliage of fruit-trees, in some parts of Germany, in the year 1791.*

Dr Bright, in passing through the district of Körmond, in Lower Hungary, says,—“ I observed an extensive forest of oak, apparently six weeks later in its vegetation than any we had passed. On inquiry, it appeared that it arose from the ravages of a destructive species of caterpillar (probably that of the *Papilio Betulæ*) stripping the whole forest of its leaves; which, the peasants told me, was here no uncommon occurrence. I find agricultural writers in Transylvania speaking frequently of this circumstance, and their fruit nurseries, in particular, seem to suffer greatly from these insects.”

* ROSEL, i. chap. 2, p. 15.

CHAPTER VII.

MEANS OF DEFENCE OF BUTTERFLIES.

CREATIVE Wisdom has endowed this tribe of animals, like many others, with certain means of defence suited to the condition in which they are placed. Several larvæ of butterflies will bite very sharply,—these are distinguished, by having at their head a semi-coronet of strong spines; while others have singular anal organs, which may have a similar use.

A numerous host of these little animals escape from birds, and other assailants, by their being so like in colour to the plants which they inhabit, or the twigs of shrubs and trees, their foliage, flowers, and fruit, that their devourers cannot readily see them.

The brilliant colours with which many of the Papilios are invested, is, in all probability, another means of defence, rather than a mere ornament,—they may dazzle their enemies. The radiant blue of the upper surface of the wings of the gigantic butterfly so prevalent in Brasil, the *Papilio Mene-laüs*, or Silver-blue Butterfly, (see plate 20,) which, from its size, would be a ready prey for any insectivorous bird, may by its splendour, which, we are

told, is inconceivably bright, produce an effect upon the sight of such birds, which would give it no small chance of escape. Latreille has a similar conjecture with respect to the Golden Wasps.

The long hairs, stiff bristles, and spines, as also the hard tubercular prominences, with which many caterpillars are clothed, may also be intended for their protection. That these are really the means of defence, is rendered more probable by the fact, that, in several instances, the animals so distinguished, at their last change of skin, previous to their assuming the chrysalis condition, appear with a smooth epidermis, without any of the hairs and spines for which they were before remarkable. Mr Kirby has a small lepidopterous caterpillar from Brasil, which is thickly beset with such sharp, strong, branching spines on the upper surface, as would enter the epidermis of the finger; and consequently furnish the caterpillar with effective weapons against enemies less formidable than man.*

Madam Merian has figured an enormous caterpillar of this kind—which, unfortunately, she could not trace to the perfect insect—by the very touch of which, she says, her hands were much inflamed, and the inflammation was succeeded by the most excruciating pain.

The chrysalids are protected by other contrivances equally effectual.

* KIRBY and SPENCE, *Intr.* ii. p. 226.

CHAPTER VIII.

OF MALFORMATIONS OF INSECTS.

LEPIDOPTEROUS insects, like other animals, are subject to malformations. We have on record accounts of some curious *lusus naturæ* of these tribes.

Such specimens are often termed hermaphrodite insects. They often prove very puzzling to inexperienced collectors; and have been frequently mistaken for distinct species. The term hermaphrodite is completely misapplied, and we are not aware of any specimens having been found entitled to this appellation.

Many instances of *lusus naturæ* in this order of insects might be adduced, but we consider the following as sufficient to show the extent of the phenomenon.

In the collection of insects belonging to Professor Germar are the following curiosities:—

1. *Papilio atalanta*. The left side male, the right side female. The left pair of wings are smaller, and more deeply indented than the right; and the left antenna is shorter than the right.

2. *Papilio antiopa*,—of which the right side is male, and the left side female. The right antenna is much shorter than the left.

3. *Papilio phæbe*. The left side is male, and the left antenna shorter than the right; and the left pair of wings smaller, but the colour and margin the same as the right. Hinder part of the body the same as the male.

Mr H. S. Smith, of Leeds, an excellent and zealous entomologist, has in his possession a singular *lusus naturæ* of the Peacock Butterfly, captured in 1827, which is entirely destitute of eyelets on the inferior wings, as well as of the dark ground on which they are placed, and the light coloured circle that surrounds them, is also wanting.

CHAPTER IX.

CLASSIFICATION OF LEPIDOPTEROUS INSECTS.

THIS is the third Order of Insects, according to the Linnæan classification.

The insects of the order which contains the various kinds of Butterflies, Sphinges, and Moths, have all four wings, covered with scales, or a sort of farina ;*

* These scales are so very minute, that they are taken for extremely fine dust. When, however, they are examined through a powerful lens, the scales are found to be placed in the most perfect order, and, where there is a diversity of colour, not unlike mosaic work of the most exquisite description. It cannot but be extremely pleasing, to the contemplative mind, to draw a comparison between the finest productions of human art, and those of the Divine Architect. Comparisons have been made between the irregularity that appears in the finest needle, when examined by a microscope, and the wonderful accuracy of the sting of a bee or a wasp ; and the unequal contexture of the finest cambric, when compared with some natural productions. The comparison instituted between mosaic and the scales on the wings of papilionaceous insects, is not less interesting.

Mosaic work is of very ancient invention, but the moderns have greatly improved the art. Pictures of various subjects

they have a mouth with palpi, a spiral tongue, and a body set with hairs. The scales resemble feathers; they lie over one another, in an imbricated manner,

are formed of it, of amazingly fine workmanship; imitations of buildings, trees, ground of various kinds, and distant mountains; and the human figure, both singly and in groups. These are produced by small pins, of variously coloured glass, stuck into a kind of paste. They are so minute in many cases, that we can hardly discern them to be an arrangement of an infinite number of particles of glass; they rather look like a picture painted with the finest colours, harmoniously blended together. The calculation made by Keysler is, that a piece of eighty square feet, if perforated with tolerable care and delicacy, would employ eight artists the space of two years.

A small piece of the wing of *Papilio Io*, (the Peacock Butterfly,) a quarter of an inch square, was cut out and placed under the third magnifier of an opaque microscope, when seventy rows of scales were counted, and ninety in each row. Consequently, there were six thousand three hundred scales on one side of this small portion of wing; so that the square inch of a wing must contain the astonishing number of one hundred thousand seven hundred and thirty-six scales. The number of glass pins in a square inch of mosaic being only eight hundred and seventy, the coarseness of such a picture, compared with the mosaic of the wing of this insect, is in the proportion of one hundred and fifteen at least to one; that is, such a picture is one hundred and fifteen times coarser than this natural mosaic.

The Peacock Butterfly is one of medium size, and the scales on it are in proportion to its size. What then must be the proportion if we compare with it some of the smaller Butterflies, whose whole dimensions are not a quarter of an inch?

The wing of a Peacock Butterfly, prematurely taken out of

or like the tiles on a roof; the shafts towards the body of the insect, and the expansion towards the end of the wing, reflecting often the most beautiful colours. The eyes are reticulated and large; and, besides these, some have two or three stemmata situated on the forehead. The palpi have from two to three articulations; they are hairy, standing outwards, and sometimes a little upwards. Butterflies, with their spiral tongues, suck the nectareous juices of flowers; but, in general, they need little food; some, indeed, whose tongue is very short, seem to take no nourishment at all. They have, on each side, nine spiracula, or organs of respiration, of which one is situated on the thorax, the other eight on the segments of the abdomen; the last segment is without any. The principal function of the perfect insect is to propagate its species, for which purpose the female, from a peculiar instinct, deposits her eggs on such plants, and in such places, as afford the proper nourishment to the larva when excluded; after which both sexes soon cease to live.

a pupa, was subjected to the same mode of investigation, when it was found to be nine and a quarter times finer than that of the perfect insect; and that the square inch contained nine hundred and thirty-one thousand eight hundred and eight scales to the square inch. So that this natural mosaic must be above ten hundred and sixty-three times finer than the mosaic of the boasted pictures of modern Rome, where ingenuity, animated by zeal, has exerted its utmost efforts.

Of this order Linnæus forms three genera, namely, *Papilio*, *Sphinx*, and *Phalæna*; which are called in English, Butterflies, Hawk Moths, and Moths.

The French authors have subdivided this order into a variety of families, tribes, and genera; but to enter into these would occupy a space far beyond our limits. I therefore confine myself to the Linnæan arrangement.

The first genus to be considered is that of *Papilio*, or what, in our language, is termed Butterfly; which Dr Johnson says is so named because it first appears in the beginning of the season of butter. According to Dr Webster, it is much more probably derived from the colour of a yellow species, which is the most common.

The varied and splendid tints of Butterflies, and their generally elegant and graceful forms, afford ample means for contemplation and admiration. Miss Jarmyn has justly observed, that the tribes of these animals, which inhabit the tropics, are at least equal in the brilliancy of their general colour to those of the birds of the same countries. Linnæus, alive to all the dazzling splendour of Butterflies, emphatically says—"See! the large, elegant, painted wings of the butterfly, four in number, covered with delicate feathery scales! With these it sustains itself in the air a whole day, rivaling the flight of birds, and the brilliancy of the peacock. Consider this insect through the wonderful progress of its

life,—how different is the first period of its being from the second, and both from the parent insect ! Its changes are an inexplicable enigma to us : we see a green caterpillar, furnished with sixteen feet, feeding upon the leaves of a plant ; this is changed into a chrysalis, smooth, and of golden lustre, hanging suspended to a fixed point, without feet, and subsisting without food. This insect again undergoes another transformation, acquiring wings and six feet, and becomes a gay butterfly, sporting in the air, and living by suction upon the honey of plants. What has Nature produced more worthy of our admiration than such an animal coming upon the stage of the world, and playing its part there under so many different masks ?”

It is no wonder that mankind were early struck with these wonderful phenomena, and that the ancients should have considered a butterfly as an emblem of the human soul. It has afforded much scope for poetry, and served to heighten the beauty of allegorical fictions : here is an example of the latter :—

Now on broad pinions from the realms above,
Descending Cupid seeks the Cyprian grove ;
To his wide arms enamour'd Psyche springs,
And clasps her lover in aurelian wings.*

* DARWIN'S *Temple of Nature*.

GENUS *PAPILIO*.—LINNÆUS.

Generic character.—The antennæ growing thicker at the extremities, in general club-shaped, or capitated; the wings, when at rest, erect, and meeting upwards. The species all fly by day.

This genus comprehends those insects called in English Butterflies, which fly by day. The first pair of legs in some of them are short, and used rather as hands for cleaning themselves, than as feet for walking. Their flight is in general quick. The caterpillars have all sixteen feet, and are for the most part prickly. Some, however, are smooth, others set with short hairs; some have a sort of tail, and others have two blunt horn-like feelers on the head.

Linnaeus divides this genus into six families. The names of the first, being mostly exotic, he has taken from those of the Trojan and Grecian chiefs; those of the others, as most of them are European, and their history and habits better known, are taken chiefly from the plants on which the caterpillars feed.

I. *EQUITES*.—Those whose upper wings are longer from the posterior angle to the apex, than from



1.

PUPA AND LARVA OF THE PEACOCK BUTTERFLY.

Papilio Io.—BRITAIN.

the angle to the base. Their antennæ are often filiform.

They are subdivided as follows:—

A. Troës; often black, with bloody spots on the breast.

B. Achivi; without the bloody spots; an ocellus at the angle of the tail.

II. *HELICONII*.—With quite entire and narrow wings, which are sometimes naked, especially towards the extremities; the upper ones oblong, the under ones very short.

III. *PARNASII*.—With quite entire wings; the upper ones rounded.

IV. *DANAI*.—With entire wings.

A. Candidi; with white wings.

B. Festivi; with wings variously coloured.

V. *NYMPHALES*.—With indented wings.

A. Gemmati; the wings ocellated.

a. ocelli, in all the wings.

b. ocelli, in the upper wings.

c. ocelli, in the under wings.

B. Phalerati; the wings without ocelli.

VI. *PLEBEII*.—Small; the larva generally contracted.

A. Rurales; the wings with obscure spots.

B. Urbicolæ; the wings with spots, which are often pellucid.

THE PEACOCK BUTTERFLY.

Papilio Io.—BRITAIN.

PLATE II.

Papilio Io, *Merian's Ins. Eur.* i. 226. *Alb. Ins.* pl. 3.
Willk. Pap. 55. pl. 3. A. 2. *Harris' Aurelian*, pl. 8.
f, k, i.—*Vanessa Io*, *Latreille*.

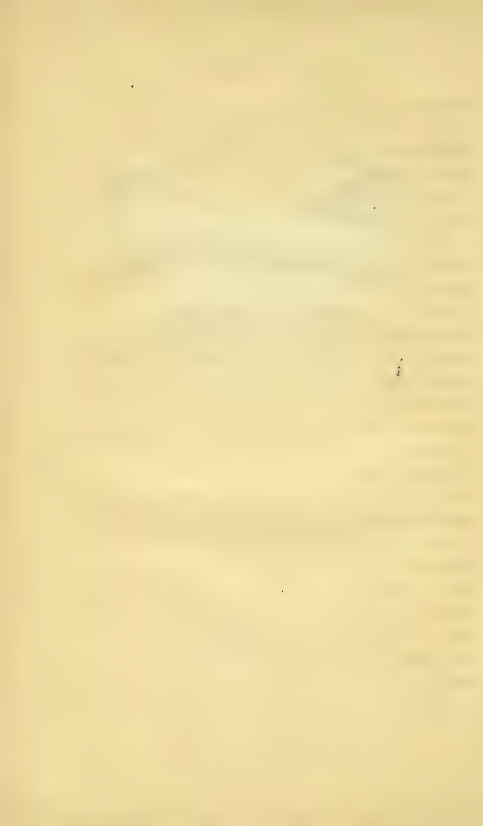
Specific character.—The head, throat, and abdomen of this splendid butterfly are of a deep reddish brown, and covered with pretty long hairs. The wings are angular, considerably indented at their posterior margins, and surrounded by a broad black band, the superior ones being of a high toned brown, approaching to red, with large compound eyelets, reddish in the centre, and the inner half of the outer circle of a rich golden yellow, the outer half being of a fine sky blue, with several dark spots in it. These eyelets are bounded on their inner sides by a triangular semilunar black patch, beyond which is a wedge-shaped patch of rich yellow, bounded with an abbreviated black band; on the exterior margin is a transverse band of golden yellow, thickly punctured with black; in the centre of the wing are two pretty large sky-blue spots. The lower wings are of a pale reddish brown, with the margins considerably indented, and a deep, black, broad border, with sub-



2.

THE PEACOCK BUTTERFLY.

Papilio Io.—BRITAIN.



caudal wings. There are on each of the lower wings a large oval sesquialterous eyelet, of deep black, surrounded by an ash-coloured ring, bounded on its outer extremity by another ring of black: the spots on the centre are deep blue, with a white semi-lunar one at top.

This insect is subject to considerable variety, in some of which the margins are deep brown. The under side of this butterfly is almost entirely black.

The caterpillars of the *Papilio Io* are produced from eggs which are deposited in the spring of the year on nettles. The larvæ are of a fine deep black, thickly beset with sharp spikes, and finely powdered with minute white specks. The belly legs are of a tawny brown, and the others black. They live in society, and are seen in the early part of summer feeding on nettles. Shortly after the little animals are hatched, they begin to spin for themselves a large and commodious web, into which they fly for shelter on the approach of rain, which the exquisite sensibility of their nervous system enables them to foresee a considerable time previous to its falling; they therefore may be depended on as excellent prognostics of changes in the state of the atmosphere. They also take refuge under this covering during the night.

When they have attained their full growth, which is about the beginning of July, they seek out some proper place where they can safely assume their

chrysalid form. In the performance of this change, they suspend themselves vertically, with the head downwards ; and the pupa, thus pendent, continues for about twenty days, at the end of which time the insect becomes perfected, bursts from its shell, expands its wings, and flies away.

The Peacock Butterfly is to be found all over Europe, especially in the more temperate parts of it. It is not uncommon in the south of England, but it is extremely rare in the north. During the winter it conceals itself, and does not die until it has deposited its eggs in the ensuing spring.

This *Papilio*, also the *P. urticae*, *atalanta*, *polychloros*, and several allied species, soon after emerging from the chrysalis form, when they take their first flight, discharge a few drops of a reddish coloured fluid, which is sometimes of the intensity of blood. In situations where these insects are numerous, it has had the appearance of a shower of blood, and, by early writers, was considered the precursor of some extraordinary event. Ovid commemorated an occurrence of this kind among the prodigies which took place after the death of the great dictator, in the following passage :—

Sæpe faces visæ mediis ardere sub astris :

Sæpe inter nimbos guttæ eecidere cruentæ.

Which has been thus translated,—

With threat'ning signs the lowering skies were fill'd,
And sanguine drops from murky clouds distill'd.

The explanations of the appearance of blood on the earth, are historically divided into four distinct periods,—namely, first, the theocratic, or period of miracles; second, the period of the Hippocratic school; third, the physical, or natural historical; and fourth, the atmospherical, or cosmical.

The first of these periods extends from the commencement of history, down to the time of Cicero, the Roman orator. In the second, the admissibility of miracles began to be questioned; and a belief in a crude and veiled condition of atmospherical and terrestrial moisture became prevalent. The third period was commenced by P'eirese of Aix. And the fourth was established by Chladnei, who was afraid of the encroachments of natural historians, in accounting for these phenomena.

In the first period, we have recorded in the Books of Moses the most ancient accounts of these miracles,—that of the blood-coloured water from Egypt, which was an immediate operation of the Almighty, and performed by Moses in the presence of Pharaoh. The Nile became red and fetid, the fishes died, and all the waters of Egypt were changed in the same manner.*

Homer took advantage of appearances of a similar kind—the showers of bloody rain which had been observed previous to, and at his time—alluding to

* *Exodus*, chap. vii. verses 19, 20, 21.

them with enlivening effect, and representing them as a direct encroachment of the gods on the established laws of nature.

The Greek and Roman classics frequently make mention of the Red Sea, as deriving its name from the red colour exhibited by its waters at different periods, owing to the showers of blood, which they considered as the immediate operations of supernatural powers, and as direct violations of the established laws of nature. Cicero was the first to question the preternatural origin of these phenomena, and endeavoured to account for them by physical means. The red colour of water he accounts for from its holding in solution a mixture of red-coloured earthy ingredients, and the express traces of blood drops on plants and stones to the bloody colouring of moisture.

From the time of Cicero till the beginning of the seventeenth century, we have many records of such natural phenomena; but no accurate or philosophical investigations of them have been offered. There was an absurd doctrine supported by the Hippocratic believers, among whom was the physician Garcæus, who, in 1568, says, blood-rain is rain boiled by the sun.

The aim of Chladnei was, the advancement of the study of truly cosmical and atmospherical bodies.

It would be foreign to our subject, although extremely interesting, to introduce, in chronological

order, the sudden overflowings of rivers with red or bloody water which have taken place, without any previous rain of that colour ; or of lakes and stagnant waters which have been suddenly or gradually coloured, without any preceding red rain. But we may mention, that modern discovery has led to a belief, that all these can be accounted for as arising from the water containing innumerable animalculæ, of the order called by naturalists infusory animals. In the year 1797, Girod Chantron observed a pond in France to be of a blood-red colour. He examined it accurately, and found, that the water, which appeared to be of a brilliant red colour, the shade of which was between cinnabar and carmine, was not itself actually red, but assumed this appearance from innumerable animalculæ, which were not visible to the naked eye, but which could be distinctly seen by the aid of a microscope.* Captain Scoresby mentions, that, in 1820, he observed the water of the Greenland Sea striped alternately with green and blue, and that those particular colours were produced by animalculæ, of such extreme minuteness, that he reckoned, in a single drop of water 26,450 animalcules ; hence, reckoning 60 drops to a drachm, there would be in a gallon a number equal to one half of the population of the globe. This coloured water, to the extent of six degrees of latitude, formed one-fourth of the sur-

* *Bullet de Sc. Nat.* n. 6.

face of the Greenland Sea.* Although this observation does not belong to the bloody colour of water, yet it clearly indicates the abundance of microscopic organic beings in water.

The meteoric substances, which are usually colourless,—such as dew, snow, rain, and hail, have been said to fall blood-red from the atmosphere.

In Stowe's *Chronicle*, we have two accounts of showers of blood ; he says, that, in the reign of Rivallo, 1766 years before Christ, “ it rained blood three dayes ; and then a great mortalitie caused almost desolation.” He afterwards writes,† “ Brithricus, of the blood of Cerdicus, was made king of the West Saxons, (about A. D. 793,) and ruled seventeen yeares. In his time it rained blood, which, falling on men's cloathes, appeared like crosses.”‡

There are two passages in Homer, which, however poetical, are applicable to rain of this kind ; and the accounts of the bloody sweat on some of the statues of the gods, mentioned by Livy, must be referred to the same phenomena ; as the predilection of those ages for marvel, and the want of accurate investigation in the cases recorded, as well as the rare occurrence of these atmospherical depositions in our own times, incline us to include them among the blood-red drops deposited by insects.

Many accounts of occurrences of this kind are

* SCORESBY'S *Arctic Regions*, vol. i.

† Page 9.

‡ Page 31.

recorded, but erroneously investigated, as related in Roman history, prior to the birth of Christ. Dio Cassius, in particular, considered, that the blood rain which fell in Egypt in the time of Octavian, must be recorded as a thing very remarkable, because it never rained in Egypt. This however is a mistake.

We are told that, in the year A. D. 65, during the reign of Nero, blood rain fell, which tinged the rivers with a red colour. Two other instances are recorded in the tenth century ; one in the eleventh ; two in the twelfth ; one in the thirteenth ; two in the fourteenth ; one in the fifteenth ; and five in the sixteenth.

The circumstances under which these isolated incidents happened, are not related,—whether these showers fell from clouds, or whether there were an abundance of clouds in the atmosphere at the time ; nor are we informed if these red showers were actually seen falling, or whether they were merely observed on the ground, and hence concluded to be drops of red rain which had fallen. These accounts have, for the most part, been accompanied with such superstitious notions, and additions so manifestly false, that we venture to account for them by phenomena within the reach of physical science.

It is no new discovery that insects are the cause of showers of blood ; for Sleidan mentions, that, in the year 1553, a great part of Germany swarmed with immense multitudes of butterflies, and that

they sprinkled the leaves of plants, buildings, and clothes, with blood coloured drops, as if there had been showers of blood.*

M. de Reaumur was the first who recorded a satisfactory and philosophical explanation of this phenomenon. An extensive shower of this kind took place at Aix, in France, in the beginning of July 1608, which threw the people of that place into the utmost consternation. It fell in the suburbs, and extended for several miles round the town. The celebrated M. de Peiresc, a philosopher who, with his varied acquirements, had studied the habits and economy of insects, was consulted on this momentous occasion. On examination, he found the walls of a cemetery near the place, as well as those of several villages, spotted with large drops of a blood-red liquid. A short time prior to this, he happened to pick up a large chrysalis, which he had carefully laid up in a box. Soon after its metamorphosis into the butterfly state, he found that it had emitted a drop of blood-coloured liquor on the bottom of the box, of the size of a French sol. On comparing this with the spots on the stones in the roads, and in the fields, he found that they were identically the same; and he then unhesitatingly pronounced that they proceeded from the same cause. His opinion was strengthened by having observed, that prodigious numbers of butterflies disported in the air at the

* MOUFFET, *Insect. Ann. Theatrum*, p. 107.

time. He farther noticed, that these miraculous drops of what the people supposed bloody rain, were never found in the middle of the town, and appeared only in places bordering on the country; and that they were not observed on houses higher than the ordinary flight of butterflies. M. de Peiresc explained the phenomenon to many curious and learned individuals, and established it as an incontrovertible fact, that the imagined shower of blood was in reality but the drops of a red liquid emitted by the butterflies. The same idea seems to have been entertained by Swammerdam, though he does not appear to have verified it from personal observation.

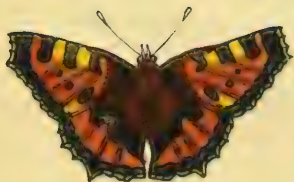
Reaumur mentions an instance of a gardener at Rouen being much terrified by digging up some of the singular cases of the leaf-cutter bees. These he considered as the results of witchcraft, and as foreboding some dreadful calamity. He exhibited them to the priest of the parish, who advised him to proceed immediately to Paris, and show them to his master. But the gardener had more sense than his pastor, and went first to the eminent naturalist Nollet with them. He knew well what they were; and, while the astonished gardener eyed him with superstitious awe, Nollet opened one of the cases and pointed out the grub it contained, and thus dispelled his apprehensions.*

* REAUMUR, vi. p. 99.

In the year 1780, Romberg noticed a shower of blood, that had excited universal attention, and which he could the more satisfactorily show to be produced by the flying forth and the casting of bees, as the phenomena in the place around the beehives themselves were remarkably striking. From this fact it is evident, that the appearance is attributable to other insects as well as the lepidoptera.

We have many other records of showers of blood, which, no doubt, may be referred to the same source; and it is worthy of remark, that these are invariably stated to have taken place in warm seasons of the year, when the papilionaceous tribes are most numerous.

This provision in the physical habits of butterflies, is analogous to a similar process in other animals, and affords a satisfactory explanation of what has been looked upon as a prodigy, and as fearful prognostics of some approaching direful event. That which historians recorded as preternatural, is now stripped of its terrors, and is ranged among circumstances which happen in the common course of nature. These appearances, both in ancient and modern times, in the hands of wicked men, had a wonderful influence in farthering their base designs over the superstitious.



3.

THE NETTLE TORTOISE-SHELL BUTTERFLY.

Papilio Urticae.—BRITAIN.

THE NETTLE TORTOISE-SHELL BUTTERFLY.

Papilio Urticæ.—BRITAIN.

PLATE III.

Papilio Urticæ, *Linn. Syst. Nat.* ii. p. 777. No. 167.—
Wilk's Pap. 56. pl. 3. a. 5.—*Vanessa Urticæ*, *Latrcille*.

THIS is one of the most beautiful papilionaceous insects of Britain. The ground colour of its wings is red, the upper wings are marked with alternate abbreviate bands of black and pale orange, or golden yellow, on the exterior margin. There are three black spots on each wing, and mottled at top, the under one large, oval, with a yellow spot at its base; the posterior margins of both superior and inferior wings have a broad black band, edged with yellow at their outer extremity, and, in their centre, a catenated fascia of blue; these margins are considerably indented; body, head, and antennæ, black; the former being thickly set with dark brown hairs; lower edge of the segments brown.

The *Papilio Urticæ* makes its first appearance in a winged state about the middle of April. It is a short lived insect; it lays its eggs in the beginning of May in great numbers on the higher stalks of nettles, and dies very shortly afterwards.

The eggs of this insect are covered with a moist,

glutinous substance, by means of which they adhere firmly to the plants on which they are deposited. About the middle of May, the young caterpillars emerge from this envelope, and may be observed, of a light green colour, congregated and moving about on the tops of the nettles, under a web of exquisitely fine fibres, which covers the whole tops of the plant, and is taken for a spider's web—to which it has a strong resemblance—by those unacquainted with the history of insects. It is not long before they cast their first skin, at which time they shift to a fresh part of the plant, and leave behind them their old covering, adhering to the web. On acquiring their third skin, they again change place, but still keep under the protection of their web. In this change they become black; after which they quickly increase in bulk, and are soon so large, that the community are forced to separate into distinct companies. They undergo, altogether, six changes of skin while in the caterpillar state, in the last of which they become solitary, living a retired life, quite remote from each other; and, in this condition, they make such ravages among the nettles, that nothing remains on the plants to which they attach themselves but the fibres of the leaves and stalks. These caterpillars are frequently so numerous, and so thickly studded on the plants, as to give them the appearance of being covered with black velvet.

The larvæ of the Nettle Tortoise-shell Butterfly

arrive at their full size about the beginning of June, when they throw out from their tails a web, by which they suspend themselves under the leaves, or on the stalks of nettles, and are transformed into chrysalids. These are at first of a green colour; but, in the course of two or three days, they change either into a bright golden-yellow, or greenish-brown, approaching nearly to bronze-green. In this condition they continue for about twenty days, when they burst from their casement, and assume the perfect, or butterfly state.

THE ORIENTAL EMPEROR.

Papilio Ripheus.—CHINA.

PLATE IV.

Papilio Ripheus, Gmelin's *Linnaeus*, 2235.—*Fabr. Mant.**Ins.* p. 6, n. 43.—*Cramer, Pap.* 33, t. 385. f. A. B.

THE superior wings are golden green, paler towards their interior margins, and clouded with large longitudinal patches of black. The colour deepens to a brilliant verdigris green, as it approaches the exterior margin. Inferior wings golden green, verdigris green at their anal margin, and with large clouds of black. Near the centre, in each, is a large undefined spot of deep carmine, with two black spots in the middle. Each of these wings is furnished with three acute points, and three caudate wings. The body is quite black; the antennæ are subulate. When extended, this butterfly measures, from the tip of each wing, five inches and a quarter.

The caterpillar of this species is unknown; but, in all probability, it bears a strong resemblance to that of the *Papilio leilas*, which has been figured in Madam Merian's *Surinam Insects*.

Besides the extreme rarity of this species, it may be reckoned the most beautiful of this splendid tribe. It is a native of China, and various other places of the East.



4.

THE ORIENTAL EMPEROR.
Papilio Riphæus.—CHINA.



5.

THE HECTOR TROJAN.
Papilio Hector.—INDIA.

THE HECTOR TROJAN.

Papilio Hector.—INDIA.

PLATE V.

Papilio Hector, *Linn. Syst. Nat.* p. 744.—*Shaw's Nat. Miscellany*, pl. 271.

THIS *Papilio* is wholly of a deep velvet black, the upper wings clouded with cleft patches of pale ochre yellow, and the centre and lower parts of the under wings, head, and tail, with crescent-shaped regular patches of bright scarlet ; and with an edge, or fillet of white round the whole margins. Inferior margin with a caudate wing.

The Hector Trojan is a native of India, but of rare occurrence, and measures four and a half inches from tip to tip of extended wings. The antennæ are very long and slender.

The strong contrast of the deep black and scarlet of this insect, gives it a striking effect.

THE AMPHRYSIUS BUTTERFLY.

Papilio Amphrysius.—JAVA.

PLATE VI.

Papilio Amphrysius, *Merian's Ins. Surinam*, t. 72?—*Cramer*, t. 219, f. A.—*Shaw's Nat. Miscellany*, pl. 650.

THE upper wings are black, with yellow streaks, and slightly indented. The lower wings are yellow, with a broad vandyked border of black, and considerably indented. The upper part of the body is deep black; and the segments, or annular process, is yellow. The eyes are scarlet.

Although this butterfly has but two colours, yet, from the strong contrast of these, it is a beautiful insect.

The *Amphrysius* Butterfly is a native of the islands of Java and Amboyna, and measures upwards of five inches and a quarter from the extremity of one wing to that of the other.



6.

THE AMPHRYSIUS BUTTERFLY.

Papilio Amphrysus.—JAVA.







7.

THE CRAMERIAN BUTTERFLY.
Papilio Cramerianus.—JAVA.

THE CRAMERIAN BUTTERFLY.

Papilio Cramerianus.—JAVA.

PLATE VII.

Papilio Iphigenia, Cramer, *Desc. de Papillons*, pl. 67, fig. D. E.
 —*Papilio Cramerianus*, Shaw's *Nat. Miscellany*, pl. 852.

THE wings are scalloped and black. Upper wings, with three sesquialterous blue bands, and variously spotted with the same colour. They have also six oblong spots of white, partly edged with pale blue, and a quadruple macular band of bluish white on the posterior margin, and a large triangular scarlet spot on each. The under wings have a very large white, transverse, and lunated band, edged with shining blue. Next the lower posterior margin, there is a row of white semilunar spots, above which is an undulated belt of blue; and still higher up, a macular band of the same colour. Under surface of the wings variously clouded, streaked, and spotted with black. The colour, orange and gray. The body is brown, and black in the middle. The eyes are red; and the antennæ slender, with large club shaped points.

This elegant butterfly is a native of the island of Java, and measures four inches, with extended wings.

THE GALANTHUS BUTTERFLY.

Papilio Galanthus.—SURINAM.

PLATE VIII.

Papilio Galanthus, *Turton's Linn.* iii. p. 58.—*Cramer, Desc. de Papillons*, iii. pl. 25, fig. D. E.

THE surface of the upper wings of the *Galanthus* Butterfly is scarlet; the posterior margins, which are scalloped, have a pretty broad margin of deep black, which extends upwards of half an inch on the anterior margin; and nearly close to the tips are two white spots. There is a large and broad articulate band extending nearly across the wings; the under wings are black, with a broad articulate band of scarlet. The body is black, and the eyes scarlet. The antennæ are very slender.

The strong contrast of the intense black and the scarlet, renders this a very striking insect. It inhabits Surinam.



8.

THE GALANTHIS BUTTERFLY.

Papilio Galanthis.—SURINAM.





9.

THE AMPHINOME BUTTERFLY.
Papilio Amphinome.—SURINAM.

THE AMPHINOME BUTTERFLY.

Papilio Amphinome.—SURINAM.

PLATE IX.

Papilio Amphinome, *Merian's Ins. of Surinam*, pl. 7.
—*Cramer, Desc. de Papillons*, pl. 54, fig. E. F.

THE wings of this insect are indented, black, and clouded with bluish green above; the superior ones marked, both on the upper and under sides, with a large, broad, white band, which extends across the wings towards their tips, from the anterior to the posterior margin, in an oblique direction; the inner margins are of a raw umber colour. Under side of the upper wings black, clouded with the same green as the upper surface; the lower wings are black, variously clouded, and marked with scarlet: all the posterior margins have a border of semilunar green spots.

The caterpillar is three inches long, of a dusky colour, with three longitudinal green spots, extending from the one extremity to the other; the head is furnished on its coronal surface with eight long horn-like spines, and the tail with two. It feeds on the *Plumeria rubra*, changes into a chrysalis in June, and emerges the complete butterfly in the month of July.

Inhabits South America, and Surinam.

THE ATYS BUTTERFLY.

Papilio Atys.—SURINAM.

PLATE X.

Papilio Atys, *Cramer, Desc. de Papillons*, pl. 269, fig. E. F.
 —*Shaw's Nat. Miscellany*, pl. 951.

THE wings of this pretty *Papilio* are black, with the body, and centre of the wings, of a rich and clear verdigris green, spreading in streaks from the body through the black; near the anterior margin on each wing are two ovate black spots, blue in the middle; there are two caudate appendages on the base of the lower wings, which terminate in a circular nob. The eyes are scarlet.

The *Papilio atys* is a native of Surinam, and is represented in the plate of the natural size.



10.

THE ATYS BUTTERFLY.

Papilio Atys.—SURINAM.





11.

THE MARSYAS BUTTERFLY.

Papilio Marsyas.—SOUTH AMERICA.

THE MARSYAS BUTTERFLY.

Papilio Marsyas.—SOUTH AMERICA.

PLATE XI.

Papilio Marsyas, *Linn. Syst. Nat.* p. 788.—*Shaw's Nat. Miscellany*, pl. 888.

THE wings are entire ; the anterior and posterior margins have a very broad band of black, while the area of the upper wings is of a rich azure blue, softening, as it descends, into a fine deep straw yellow. The lower wings are of a pale bluish green, with two long slender caudate wings on each, furnished at the points with round knobs ; above the lower edges are crescent-shaped black spots, surmounted by a round black spot, at the outer side of which is placed an upright club-shaped black spot. The body is black ; straw brown on the centre.

This beautiful little *Papilio* is a native of South America. It is figured of the natural size.

THE IMPERIAL TROJAN.

Papilio Priamus.—AMBOYNA.

PLATE XII.

Papilio Priamus, *Linn. Syst. Nat.* ii. p. 744. No. 1.—
Clerk, Icon. Ins. Var. t. 17.—*Shaw's Nat. Miscellany*,
 pl. 15.

THIS superb butterfly has the upper surface of its wings of a brilliant green, shaded of a paler colour towards the upper and lower discs of the superior wings; all the wings have a black margin entirely surrounding them; in the centre of the upper wings are two large longitudinal black patches, which occupy nearly the half of them; on each of the lower wings are four large circular black spots, and a golden yellow square spot close to the edge of the upper surface; the head, and upper part of the back, are black, the latter with a large oval spot in its centre, the upper half of which is green, the lower half yellow, and two smaller green spots beneath it; the eyes are bright fawn colour; the abdomen is of a pale chestnut; the inner edges of the wings are pale brown; the antennæ are thickened at the top, but taper to a point.

Linnæus considers this to be the most beautiful of all the papilionaceous tribe of insects. He says,



12.

THE IMPERIAL TROJAN.

Papilio Priamus.—AMBOYNA.

“ It is by far the most august of all the *Papilios*, being all over of a silky appearance ; and it may be doubted whether Nature has produced any object more beautiful amongst insects.”

The Imperial Trojan is a native of the island of Amboyna, and it is regarded as one of the most curious and valuable of butterflies. Nothing can exceed the richness of the green colour, which, in particular lights, is not only of an appearance far superior to the finest satin, but has also a golden tinge diffused through it, which produces the most beautiful contrast with the deep blue green on the rest of the wings.

The *Papilio Priamus* measures upwards of seven inches and a half from the tip of one wing to that of the other, and stands foremost among the Linnæan division of the large butterflies, which forms the two sections of Trojan and Grecian Warriors, or Equites. The butterflies of those sections are distinguished from all others by the remarkable shape, or outline, of their upper wings, which are larger, if measured from the hinder corner to their anterior extremity, than from the same point to their base. The Trojan Equites have generally red, or blood coloured spots on each side of their breasts. The prevailing colour, also, of this division is black.

THE ÆNEAS BUTTERFLY.

Papilio Æneas.—COCHIN CHINA.

PLATE XIII.

Papilio Æneas, *Linn. Syst. Nat.* ii. p. 747. No. 16.—
Gmelin's Linn. p. 2233.—*Shaw's Nat. Miscellany*,
 pl. 512. fig. 1.

THE whole upper surface of the wings of the Æneas Butterfly is black ; in the centre of the superior ones is a large, irregular, bright green patch ; the under wings have each five oblong-oval crimson radiated spots ; the upper wings are slightly, and the under ones deeply, indented on their posterior margins ; the body is black, furnished on each side with a row of crimson spots ; on the shoulders, there is a crimson triangular spot ; the head and eyes are green.

This rare and splendid butterfly is a native of Cochin China. It measures four inches and an eighth in breadth.



13.

THE AENEAS BUTTERFLY.

Papilio Aeneas.—COCHINCHINA.



14.

THE ANCHISES BUTTERFLY.

Papilio Anchises.—SURINAM.

THE ANCHISES BUTTERFLY.

Papilio Anchises.—SURINAM.

PLATE XIV.

Papilio Anchises, *Linn. Syst. Nat.* p. 146.—*Seba Mus.* iv. pl. 7, fig. 27, 28.—*Merian, Ins. Surinam*, pl. 17.

THE whole upper surface of the wings of this *Papilio*, as well as the body, is black ; the posterior margin of both upper and under wings are considerably indented, with a row of semilunar interrupted white spots along the margin of the upper wings, and a white, continuous, narrow border on the lower ones ; on each of the upper wings is a large patch of pure white, and the under wings have each six oblong-oval upright spots of crimson ; on the internal margin of the wings, parallel with the crimson spots, are two small white dots on each wing ; the tail is ciliated, and the antennæ thick at the base and tapering to a point, the tips being lance-shaped. The breadth of the butterfly, when the wings are extended, is five inches and three quarters.

According to Madam Merian, a small species of lemon grows in the woods of Surinam, rising to the height of a tall apple-tree, but with leaves and flowers of not more than half the size of the common kind. On these trees are found great numbers

of the caterpillars of the Anchises Butterfly, collected together in groups, and adhering to each other like snails. Their colour is brown, the annulations being intersected by numerous white longitudinal stripes; and, when touched, they protrude from their front a pair of soft, yellowish horns, as if to defend themselves, or to attack their enemies. Madam Merian kept some of these caterpillars on lemon leaves till the 20th March; at that period they changed into a chrysalis, out of which, on the 2d of April, proceeded the Butterfly.



15.

THE ANDROMACHA BUTTERFLY.

Papilio Andromachus.—SOUTH AMERICA.

THE ANDROMACHUS BUTTERFLY.

Papilio Andromachus.—SOUTH AMERICA.

PLATE XV.

Papilio Andromachus, *Shaw's Nat. Miscel.* pl. 635.—*Linn. Syst. Nat.* p. 744.—*Cramer, Desc. de Papillons*, pl. 56, f. A. B.

THIS large and curious insect is of a dull fawn colour, fulvous at the posterior margin, within which is a broad, black, doubly vandyked band, and a large triangular patch of black, extending from the insertions of the wings three-fourths across them; they are slightly indented; the under wings have a greatly broader black band than the upper ones; it reaches to the very margin, with a double row of equidistant, oblong, fawn-coloured spots within the edge, and a single row of four round spots, of the same colour, towards its upper extremity; the body is dark brown; the antennæ are very long and slender.

This insect is an inhabitant of the warmer parts of South America. It is of a large size, extending, from the tips of the wings, to six inches and three quarters.

THE ORANGE TIP BUTTERFLY.

Papilio Cardamines.—BRITAIN.

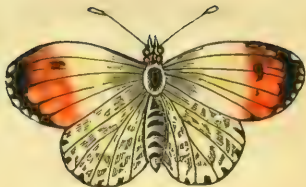
PLATE XVI.

Papilio Cardamines, *Linn. Syst. Nat.* ii. 261, No. 35.—*Wilk's Pap.* ii. p. 50, tab. 3, 5.—*Pontia Cardamines*, *Latreille*.

THE wings are rounded, white ; with the edges very slightly scalloped ; posterior margin black, with a row of white spots near the edge ; within the black edge is a large patch of orange, having a black spot in the middle ; under side of the wings marbled with green ; the under wings are white, marbled with gray, and an interrupted black border on their outer margin ; the body is white, with an oval black mark on the back, and triangular black patches on the segments of the abdomen ; the eyes are green, and beneath each there is a small circular spot of red.

The female has no orange tip to the wings. The specimen from which our figure is taken was foreign, and is nearly double the size of those found in Britain.

This pretty butterfly is also called the Lady of the Woods, and may be taken in great abundance in the month of May. The caterpillar is common in May and June ; is of a deep reddish brown colour, with a white stripe above the legs, and feeds on shepherd's



16.

THE ORANGE-TIP BUTTERFLY.
Papilio Cardamines.—BRITAIN.

purse, (*Thlaspi bursa pastoris*,) common lady's smock, field cabbage, &c. (*Cardamine pratensis*.) Harris says it also feeds on wild cole.

The caterpillar changes to a chrysalis about the end of June, which is greenish, with a yellow streak on the sides, and on the wing-cases of the male is a saffron-coloured spot, and it is not till the following May that it becomes a butterfly.

This *Papilio* is common in fields and lanes, and near woods.

THE ADONIS BUTTERFLY.

Papilio Adonis.—SURINAM.

PLATE XVII.

Papilio Adonis, *Linn. Syst. Nat.* p. 744.—*Cramer, Desc. de Papillons*, pl. 61, fig. A. B.

THE wings on the whole upper surface are of a bright Antwerp blue, and slightly denticulated; the extreme points of the upper wings are black, and the lower angle of the under ones the same; towards the points of the upper are two white spots on each; the under surface of the wings is gray, clouded with undulated patches of pale brown and dark gray, with five ocellated, fawn-coloured spots.

The breadth of the extended wings is four inches and a half.

This highly beautiful insect is a native of Surinam, and, according to Madam Merian, it is abundant in that country.



17.

THE ADONIS BUTTERFLY.
Papilio Adonis.—SURINAM.



18.

THE GREAT COPPER BUTTERFLY.

Papilio Hippothoe.—BRITAIN.

THE GREAT COPPER BUTTERFLY.

Papilio Hippothoe.—BRITAIN.

PLATE XVIII.

Papilio Hippothoe, *Linn. Syst. Nat.* ii. p. 793, No. 254.—*Donovan's Brit. Ins.* pl. 217.

THE whole upper surface of the wings has a brilliant red copper lustre, as well as the body ; all the wings have an external border of deep black, and the upper ones a row of oblong, transverse, equidistant, black spots within the border, and two black spots near the centre of the wings ; the border on the lower wings is vandyked at its upper edge ; a black longitudinal line runs along the centre of the body ; the lower wings are semi-swallow-tailed.

The under surface of the upper wings is brownish ash colour, ocellated with black, having a broad cream-coloured border ; the lower wings are grayish blue, and ocellated with black ; exterior margin of same colour, within which is a broad border, or fillet, the same colour as the upper wings, with a row of equidistant black round spots on each side ; body, beneath, fawn-colour.

This is the largest of the Copper Butterflies which is found in Britain ; it is not uncommon in Scotland. The female is larger than the male, and with a greater number of black spots on the wings,

THE CLOUDED YELLOW BUTTERFLY.—FEMALE.

Papilio Hyale.—BRITAIN.

PLATE XIX.

Papilio Hyale, *Linn. Syst. Nat.* ii. 764, No. 100.—*Fav. So.* 1040.—*Donovan's Brit. Ins.* pl. 238.

THE Hyale Butterfly extends two inches and a quarter from the tips of the wings; the antennæ are short; the head, throat, and abdomen are of a brownish yellow; the superior wings are of a yellow orange; on the upper wings, a black, on the lower, an orange spot in the centre, and a deep irregular border of black on the margin. The female has a row of yellow or white spots in the centre of the border, which in both sexes is fringed.

This insect has been described by several authors, English as well as foreign, and the naturalists of Germany have generally noticed it. In Britain, insects of this order seem to be, in general, peculiar to our country; but the Clouded Yellow Butterfly appears to be found in almost every part of Europe, and is said to abound also in Africa and America, differing a little, of course, with the locality.

The breadth of this insect, in England, rarely exceeds two inches; but, influenced by a warmer climate, it is found of a much greater size. Northern countries do not seem to be so congenial to the growth



19.

THE CLOUDED YELLOW BUTTERFLY.

Papilio Hyale.—BRITAIN.

of papilionaceous insects, as more southerly latitudes. In Britain, the *Papilio Hyale* is considered rare, although it has occasionally been abundantly found in Kent and the neighbouring counties. In the year 1793 it abounded in these districts. The fly is to be taken in autumn, but seldom after August.

THE SILVER-BLUE BUTTERFLY.

Papilio Menelaus.—SOUTH AMERICA.

PLATE XX.

Papilio Menelaus, *Linn. Syst. Nat.* p. 749.—*Merian's Ins. Sur.* pl. 53.—*Cramer, Desc. de Papillons*, ii. pl. 21.

THE upper surface of the wings of the Silver-Blue Butterfly, is of a brilliant verdigris green ; the anterior margin has a broad black band, in which are five oblong-ovate transverse white spots ; round the whole posterior margin is a narrow black border, the margins being indented ; the body and eyes are black ; the whole under surface of the wings clouded with brown, and marked with large ocellated spots ; the antennæ are short, and thickening towards the points, which are club-shaped ; extent of the wings, five inches and three quarters.

So uncommonly bright and brilliant is this superb insect, that it can be but faintly expressed by the utmost efforts of artificial colouring, and may serve as an instance, amongst many others, of the inimitable beauty which Nature alone can produce.

Linnæus, in his description of this splendid insect, observes, that the blue on the upper surface is so polished and lively, that scarcely any other natural



20.

THE SILVER-BLUE BUTTERFLY.

Papilio Menelaus.—SOUTH AMERICA.



object can come in competition with it. On the contrary, the under surface of the same animal exhibits an example of a species of beauty, resulting from a varied combination of the plainest and most sober colours, the ground colour being brown, slightly streaked with higher shades, and marked by several very large ocellated ferruginous spots, with dark rings and white pupils.

Dr Shaw says,—“ If it were not almost bordering on temerity to attempt a reason for this striking difference between the two surfaces of the same insect, one might suppose that this sobriety of colouring on the lower side, is intended, in some measure, to secure the animal, when sitting at rest with its wings closed, from the depredations of birds, which are less likely to be attracted in this state, than by the full lustre of its expanded plumage.”

It is a native of South America ; the caterpillar is very large, and of a yellow colour, thickly beset with black spines.

THE EMPEROR OF THE WOODS, OR PURPLE HIGHFLIER.

Papilio Iris.—BRITAIN.

PLATE XXI.

Papilio Iris, *Linn. Syst. Nat.* p. 476.—*Harris's Aurelian*,
p. 5. pl. 3.—*Shaw's Nat. Miscel.* pl. 862.

THE antennæ are club-shaped; the wings are indented, purple above, changing to brown in different lights; they are darker round the edges, the depth of tone being nearly black; the upper wings have seven distinct white spots, the largest of which is triangular, which joins to a sesquialterous white band, crossing them in a diagonal direction; in the centre of the lower half is an annulet of bright orange, with an internal ring of black and white in the centre; the head and body are dark raw umber brown; the eyes orange; the whole under surface of the insect is black, brown, and white.

The *Papilio Iris* is esteemed among the most beautiful, and placed with the rare of the British Lepidoptera. The cursory reader may not perceive that superiority, particularly as many of the minute insects infinitely excel it in real beauty and richness of colouring; but the scientific will be ever ready to give it the first place as a British Butterfly.



21.

THE EMPEROR OF THE WOODS, OR PURPLE HIGHFLYER.

Papilio Iris.—BRITAIN.

It derives the title of Purple Highflier from the circumstance of its very rarely descending to the ground; except in some few instances, having hitherto been only captured in elevated situations; and even those instances have been after a strong wind or heavy fall of rain. The tops of the loftiest forest trees afford it an asylum; and in the caterpillar and chrysalis state, it is preserved from the wanton cruelty of man, by the almost inaccessible height of its habitation. The larvæ feed on the sallow, (*Salix caprea*.) They are obtained by beating the branches of the tree with a pole twenty or thirty feet in length; in which case it is a necessary precaution to cover the ground beneath with large sheets, to a certain distance, lest the larvæ should fall and be lost among the herbage.

The caterpillar is hatched about the end of May or beginning of June; and early in July it passes to the chrysalis condition; and undergoes its final change into the imago, or perfect butterfly, in the end of that month, or in the beginning of August.

The great difficulty and trouble in rearing the caterpillar of this *Papilio*, even after it has been found, and the still greater difficulty of taking the butterfly, has stamped a valuable consideration on it, and particularly so when the colours are bright, and the insect in a perfect condition; and, therefore, a high price is obtained for it when in a good state of preservation. The male is smaller, but

more beautiful than the female, the upper side of the wings of the female not being enriched with that vivid change of purple, which the male possesses in such an eminent degree ; but, on the other hand, Nature has, to a certain extent, compensated for this in the female, as the under side of her wings are far richer, in the various tints of colour, than those of the male. They are both beautifully spotted, mottled, and covered with brown, black, white, and orange. The chrysalis is of a very delicate texture, much resembling the white pupa, and is tinged in several parts with a very lively purple hue, which is transmitted from the wings of the enclosed insect, and bears the characteristic mark of a *Papilio*, by being suspended from the tail, with the head downward.



22.

THE PLANTAIN FRITILLARY.
Papilio Cinxia.—BRITAIN.

THE PLANTAIN FRITILLARY.

Papilio Cinxia.—BRITAIN.

PLATE XXII.

Papilio Cinxia, *Linn. Syst. Nat.* ii. p. 784, No. 205.—
Wilk's Pap. 58, tab. 3, a. 8.—*Donovan's Brit. Ins.* pl. 242.

THE wings are indented, and of a bright chestnut brown colour, clouded with black ; the margin with a row of oblong white spots ; the under side is fulvous, with three whitish bands across the lower wings, marked with black spots.

The larva is black, beset with spines and tufts of the same colour. The sides are marked with a double row of white spots ; and the feet are red. It is found on the long plantain in April. It becomes the perfect insect in May. This is the rarest of the British Fritillary Butterflies, if we except the *Popilio Lathonia*, the Queen of Spain Butterfly.

THE ARCHIPPUS BUTTERFLY.

Papilio Archippus.—AMERICA.

PLATE XXIII.

Papilio Archippus, *Fabr. Ent.* iv. p. 49.—*Cramer, Desc. de Papillons*, pl. 206, fig. 8, E. F.

THE centre of all the wings is deep fulvous brown, surrounded by a black band, which is thickly studded with irregularly shaped white spots and dots. At the outer extremity of the upper wings there are two large oblong fulvous spots, and several others of yellow and purple. The body is black, and dotted with white on the back.

The extent of this insect is four inches and an eighth. The antennæ are rather short and slender for the size of the butterfly. It inhabits Carolina and Virginia.

The caterpillar is white, with transverse bars of dark brown. It feeds chiefly on the leaves of the *Asclepias carassavica*. The pupa is of a pale green, with several bright golden yellow spots.



23.

THE ARCHIPPUS BUTTERFLY.

Papilio Archippus.—AMERICA.



24.

THE PERANTHUS BUTTERFLY.

Papilio Peranthus.—COCHIN CHINA.

THE PERANTHUS BUTTERFLY.

Papilio Peranthus.—COCHIN CHINA.

PLATE XXIV.

Papilio Peranthus, *Gmelin's Linné*, p. 2232.—*Shaw's Nat. Misc.* pl. 512, fig. 2.

THE upper and under wings of this insect are black, with an area of yellow green around the body, and a macular band of transverse oblong-ovate olive green spots in the centre of the black, on the upper wings, which are entire. The lower wings are considerably scalloped, or indented, with two broad caudate wings. The body, head, and eyes are black; and the antennæ are short, in proportion to the size of the insect, which measures nearly four inches and three quarters in breadth.

This insect inhabits Cochin China, and is more remarkable for the singularity of its general form, than for its beauty. It is exceedingly clumsy and heavy in its appearance.

THE SWALLOW-TAIL BUTTERFLY.

Papilio Machaon.—BRITAIN.

PLATE XXV.

Papilio Machaon, *Linn. Syst. Nat.* ii. p. 750, No. 33.—
Wilk's Pap. tab. 47, fig. 1, a. 1.—*Donovan's Brit. Ins.*
 pl. 209.

THE upper surface of the wings is of a fine deep straw yellow. Upper wings long in proportion to the under ones, measuring three inches and seven-twelfths; their whole exterior margins are furnished with a broad black border, having near its outer edge a double row of longitudinal spots of the same colour as the wings, within which, on the upper wings, are corresponding fasciculi of small dots. Towards the external margin are two large oblong patches of black, in the middle of which are blotches of azure blue. Under wings considerably indented; in place of the bundles of dots, are corresponding blotches of azure blue; and at the anterior angle of the lower wing, on the border, is a scarlet circular spot.

The body is black, blue in the centre, having a longitudinal central line, extending nearly to the point of the tail.

This *Papilio* and the *Papilio podalirius*, are the



25.

THE SWALLOW-TAIL BUTTERFLY.
Papilio Machaon.—BRITAIN.

only two species of Swallow-tail Butterflies that have yet been found in Britain. Both are very scarce; but the present less so than its congener. The caterpillar is smooth pale green, with black red-spotted rings. The chrysalis is of a yellowish green colour. Harris says it feeds on wild fennel and carrots in July and September. He mentions that one he found, remained in the chrysalis state from the 23d September till the 15th May following; and another, that changed July 14th, produced a butterfly on the 10th of August. He adds, that the species was found in the meadows of Bristol and Westram. It also inhabits Kent, Norfolk, Hants, and Cambridge.

This insect is common on the Continent of Europe.

THE CAMBERWELL BEAUTY.

Papilio Antiopa.—BRITAIN.

PLATE XXVI.

Papilio Antiopa, *Linn. Syst. Nat.* ii. p. 776, No. 169.—Maxima Nigra, *Wilk's Pap.* 58, tab. 2, a. 10.

THE wings are angulated, of a rich purplish brown, with a pale straw-coloured exterior marginal border, within which is a fillet of black, with a row of equidistant blue eyes in the middle; on the anterior margin of the upper wings are two straw-coloured spots, and nearer the body a double row of little punctated spots of the same colour. The body is burnt umber brown, the eyes scarlet, and the antennæ claviform. The under side of the butterfly is of a blackish brown, with irregular dark streaks. The yellowish border is visible on that side.

This beautiful insect is found in every part of Europe. In Germany in particular it is very common; and no less frequent in America. Britain is the only country where it is esteemed a rarity, although some seasons it is found abundantly in England; but its appearance is neither annual nor periodical; hence its value by English collectors.

There have been several instances of this insect being found in different parts of the country in mild



26.

THE CAMBERWELL LEAUTY.
Papilio Antiopa.—BRITAIN.

seasons, as plentifully as the Peacock or Admirable Butterflies ; in the summer of 1793, in particular, they were in some places as numerous as the common White Butterfly.

But, as a proof that its appearance does not altogether depend upon the temperature of the weather, there have been many of our hottest seasons, which are most favourable to the propagation of all kinds of insects, in which not a single specimen of the Camberwell Beauty was to be met with.

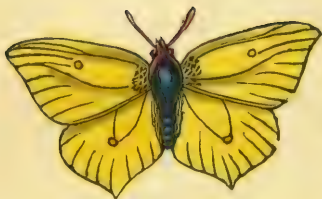
It is from the uncertainty of the appearance of this *Papilio*, that we have such varied accounts of its scarcity and abundance. It must have been long known to the British lepidopterist ; yet it received the name of Grand Surprise from Harris, or some of the Company of Aurelians, of whose society he was a member. This name was evidently intended as a significant expression of their admiration, not of the beauty of the insect, but of the singular circumstance of the species remaining so long in those very places where the most diligent researches of preceding collectors had been made in vain. Of their unwearied industry they were well persuaded ; and were, therefore, unable to account for the appearance of a numerous brood of large insects, which must have remained concealed many years, or been lately transported to those places.

Harris, in his *Aurelian*, calls it the Camberwell Beauty ; and, in his list of English Butterflies,

Hawk Moths, and Moths, he uses the name *Grand Surprise*. We mention this circumstance, as it appears very inconsistent, that he should make use of these two names indiscriminately in the several editions of both works. We still find it, in the *Aurelian*, Camberwell Beauty, and in the other, *Grand Surprise*; from which it might readily be inferred, that he meant two distinct insects, were it not for the addition of the Linnæan name, *Papilio Antiopa*.

The English specimens differ from those of other countries, in the colour of the light exterior border of the wings. In the former, that part is very pale straw yellow, or, in some instances, inclining to dirty white. In the latter, it is of a deep yellow, marked and spotted with brown. Fabricius, who notices this, says they are varieties; but this variation we consider the result of local habitation alone.

The caterpillars feed on the willow; and are generally found on the highest branches of the tree. They change from this state to that of the chrysalis, in July.



27.

THE BRIMSTONE BUTTERFLY.
Papilio Rhamni.—BRITAIN.

THE BRIMSTONE BUTTERFLY.

Papilio Rhamni.

PLATE XXVII.

Papilio Rhamni, *Linn. Syst. Nat.* ii. 765, No. 106.—
Donovan's Brit. Ins. pl. 145.—*Gonepteryx Rhamni*, *Lat.*

THE wings are angulated, sharp at the dimidiate margin ; the colour, a bright sulphur yellow, with a small crimson spot in the centre of each ; the head and antennæ deep crimson, the eyes and body bluish gray ; the under side pale yellow, the exterior margin being of a deeper colour, with equidistant small spots of pink ; centre of the wings, with pale crimson spots.

The Brimstone Butterfly is common in many places in the month of June. In its caterpillar state, it is very seldom taken ; and when in the chrysalis condition, it is generally so concealed among the herbage, that it is almost impossible to be discovered, from its green colour according so well with the surrounding leaves. In this state it is suspended by the tail ; but has such muscular strength, that if touched, it can throw itself upright immediately, in the same manner as the pupa of the *Phalæna pentadactyla*. The caterpillar feeds chiefly on buckthorn, whence it has received the specific name of *Rhamni*.

The male alone is of a vivid yellow. The female is of a dull greenish white.

THE MAZARINE-BLUE BUTTERFLY.

Papilio Arion.

PLATE XXVIII.

Papilio Arion, *Linn. Syst. Nat.* ii. p. 789, No. 230.—
Donovan's Brit. Ins. pl. 184.

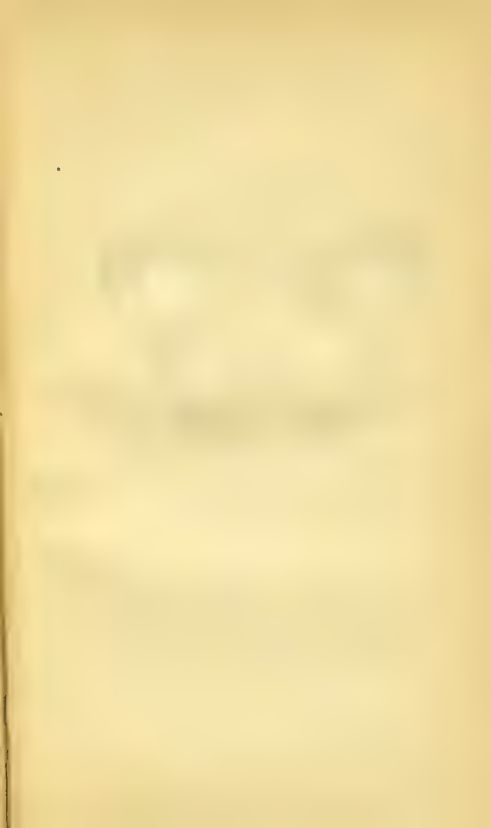
THE whole upper surface of this insect is of a fine deep blue. The exterior margin in both wings has a border of deep black; the upper wings a row of equidistant, and the under ones a row of triangular, blue spots. On the centre of each wing is a lunated black spot, betwixt which and the border on the upper wings is a row of four oval black spots, and on the lower wings, under the lunated spot, is a row of similar shaped black spots, six in number. On the outside of the black border, is a very narrow edge of white, which is fringed. The body is purple above; and the whole under surface of the insect is pale brown, studded thickly with black spots.

The Mazarine Blue Butterfly is a very scarce insect in this country; and it does not appear to be much more common in any other part of Europe. We are as yet totally ignorant of its larva.



28.

THE MAZARINE-BLUE BUTTERFLY.
Papilio Arion.—BRITAIN.





29.

THE BOLINA BUTTERFLY.
Papilio Bolina.—AMBOYNA.

THE BOLINA BUTTERFLY.

Papilio Bolina.

PLATE XXIX.

Papilio Bolina, *Cramer, Desc. de Papillons*, pl. 205, fig. A. B.
 —*Shaw's Nat. Misc.* pl. 955.

THE wings are of an intense black, denticulated with a vandyked border of white. On each side of the wings is a large, circular, violet spot, softening into white in the centre. The upper wings have, besides, two pale blue spots towards their extreme points. The body is peach colour; the head is black, with four eyelet spots; and the eyes are scarlet. The antennæ are long and slender. The under surface is variously clouded, streaked, and mottled with black, brown, orange, and blue. The extent of the wings is four inches.

The Bolina Butterfly inhabits the island of Amboyna. There are several varieties of this insect.

THE BROWN HAIR-STREAK BUTTERFLY.

Papilio Betulæ.

PLATE XXX.

Papilio Betulæ, *Linn. Syst. Nat.* ii. 220.—*Donovan's Brit. Ins.* pl. 250.—*Hisperia Betulæ*, *Fabricius Entom. Syst.* 1070.

THE wings and body are of a beautiful, high-toned, reddish brown, with a large semilunate patch of rich orange on the upper wings, slightly clouded with brown on its upper disc. The lower wings are furnished with short caudate wing appendages, of a bright orange colour. The under surface of the wings and body is of a fulvous colour, the upper wings having a border of dark brown in their interior margin; also, a large sesquialterous band, and a circular spot of dark ash colour, surrounded by a white margin. The lower wings have two long sesquialterous fasciæ, extending nearly across their centre.

The male of this species is distinguished by the orange spot on the upper wings, the female being devoid of it. The larva is remarkable on account of its being so broad and flat. It is of a dull green, streaked, with a row of short hairs extending along



30.

THE BROWN HAIR-STREAK BUTTERFLY.

Papilio Betulae.—BRITAIN.



its back. It is found in the months of May and June on the alder and sloe, on which it feeds ; and changes to the chrysalis condition in the first week in July. The pupa is of a burnt umber-brown colour, and changes to the perfect insect in August.

THE CASSIA BUTTERFLY.

Papilio Cassiæ.

PLATE XXXI.

Papilio Cassiæ, *Shaw's Nat. Misc.* pl. 791.

THE upper surface of the wings is of a bright cinnamon brown, and considerably indented, with a broad, scalloped, sesquialterous, bright golden-yellow band, traversing both the upper and lower wings. At the exterior margin, it is of a deep saffron, or golden-yellow, gradually softening into the prevailing tint. The body is of the same colour as the wings. On the upper wings, towards their tips, are two pale blue roundish spots. This *Papilio* measures four inches and a half in breadth. The caterpillar is large, being three inches in length. It is of a pale willow-green above, with transverse broad bands. A longitudinal fillet of blue extends from the head to the tail, banded on each side by crimson; beneath which is another longitudinal band of rich yellow, bounded on its lower extremity by a white band. The belly is deep olive green. The head is green, furnished with two ciliated appendages, like antennæ, and two hooked teeth-like processes. On the coronal surface, are three upright horns of green, tipped with crimson. The tail has two long horn-like



31.

THE CASSIA BUTTERFLY.¹
Papilio Cassia.—SURINAM.

appendages. This caterpillar feeds on the different twigs of the cassia tree, and changes to the chrysalis in the month of May. It is an inhabitant of Surinam.

The chrysalis is two inches long, beautifully clouded with brown, pink, and cinnamon.

The Cassia Butterfly emerges from the chrysalis in June, and may be regarded as one of the prettiest of its species, from the richness and harmony of its colours.

THE DEIPHOBUS BUTTERFLY.

Papilio Deiphobus.

PLATE XXXII.

Papilio Deiphobus, *Linn. Syst. Nat.* p. 744.—*Cramer, Desc. de Papillons*, i. p. 64, pl. 40.—*Shaw's Nat. Misc.* pl. 540.

THE upper wings are deep brownish black, slightly indented, and marked with two acute triangular patches of crimson on the shoulders. The lower wings are deeply indented, and clouded with white, crimson, and black; furnished with two large caudate wings. The body, head, and eyes are black. The antennæ are rather slender, with large knobs at their tips.

This insect measures six inches and a half in breadth. It inhabits India. The different specimens are observed to vary occasionally in their colours.



32.

THE DEIPHOBUS BUTTERFLY.
Papilio Deiphobus.—INDIA.



53.

THE CHALK-HILL BLUE BUTTERFLY.

Papilio Corydon.—BRITAIN.

THE CHALK-HILL BLUE BUTTERFLY.

Papilio Corydon.

PLATE XXXIII.

Papilio Corydon, *Donovan's Brit. Insects*, pl. 236.—*Hesperia*
Corydon, *Fabricius, Ento. Syst.* iii.

THE whole upper surface of the wings and body of this butterfly are of a pale silvery blue, with a broad, black, fringed margin; that of the lower wings with a row of central equidistant blue rings, or eye-like spots. The under surface of the insect is of a grayish brown, with a black margin, having a double row of white spots in the centre. All the other parts of the wings are ocellated.

This is an exceedingly local British butterfly, and has only been found on the Chalk Hills, between Dartford and Rochester, particularly on a long range of hillocks, leading from Dartford to the wood of Darent-Home. This butterfly has been called the Chalk-Hill Blue Butterfly, from the locality where it has been found. We believe it has not been detected in any other part near London. The larva is unknown. It appears in its winged state in the first and second week of July.

The female is brown above, with sometimes a slight tinge of blue near the base of the wings, edged with yellow spots; under side generally darker than the male, and the spots more distant.

THE PHORCAS BUTTERFLY.

Papilio Phorcas.

PLATE XXXIV.

Papilio Phorcas, Gmelin's *Linn. Syst. Nat.* p. 2239.*Cramer, Desc. de Papillons*, i. pl. 2, f. b. c.

THE upper surface of the wings, the body, head, and eyes of this *Papilio*, are black. A large cloud of a bright green runs through the centre of the upper and under wings, the latter of which are furnished with caudate wings, and macular bands of green, about an eighth of an inch from the margins; the upper wings have a large and small green spot near their points. The under side of the body is the same as the upper, but paler in the colour.

This is a fine insect; it is a native of Africa, and is said to be not uncommon at Sierra Leone. It measures four inches in length.



34.

THE PHORCAS BUTTERFLY.

Papilio Phorcas.—SIERRA LEONE.





35.

THE MARBLED BUTTERFLY.

Papilio Marmorca.—BRITAIN.

THE MARBLED BUTTERFLY.

Papilio Marmorea.

PLATE XXXV.

The Marmoreas, *Harris' Aurelian*, pl. 11. fig. κ.—*Hipparchia Galathea* of Latreille.

THE upper surface of the wings are black, beautifully marked with various shaped spots of white and yellow; there is a belt of white and black square spots surrounding the posterior margins of both wings, and on the lower one are two annulated eye-like spots.

The eggs of this insect are dropped separately amongst grass, and are of a yellowish colour when first deposited, but become afterwards of a clear white.

The caterpillar feeds on grass, and lives through the winter. It gets full fed in the beginning of June, and then changes into a chrysalis; in which condition it remains twenty days, when it emerges the perfect butterfly.

The female differs considerably from the male, the lower wings being of a tawny orange colour.

Although there is but little variety of colour in this insect, yet it is very beautiful, and may be

considered as one of the most interesting of British lepidopterous insects.*

* Professor Rennie says, that a species of mite, or bug, (*Leptus phalangii* of De Geer,) infests this insect; and that he particularly remarked it in the year 1830, at Havre de Grace. So thickly studded were some of the poor animals with these troublesome parasites, that they were hardly able to fly, from the exhaustion caused by the little bloodsuckers; and so pertinaciously did they maintain their hold, that several of them adhered to the Papilios even after they were placed in the Professor's cabinet. It is a remarkable circumstance, that although the Ringlet Butterfly, (*Hipparchia hyperanthus*,) was very abundant at the same time, and their food and habits are similar to those of the *Galathea*, not one of the parasites was to be found in some hundreds which he caught expressly for the purpose of ascertaining the fact.† The common Humble Bee is infested by a parasitic mite, which often proves the cause of its death; but it has been observed, that, differently from the mites above mentioned, they always quit the bee before death, or at least the instant it dies.

† *Insect Trans.* p. 28.





36.

THE PURPLE HAIR-STREAK BUTTERFLY.

Papilio Quercus.—BRITAIN.

THE PURPLE HAIR-STREAK BUTTERFLY.

Papilio Quercus.

PLATE XXXVI.

Papilio Quercus, *Gmelin's Linn. Sys. Nat.* i. p. 2341.—*Donovan's Brit. Ins.* pl. 460.—*Hesperia Quercus*, *Fabricius, Sp. Hist.* ii. p. 118, No. 527.

THE wings are of a deep bistre brown, the upper ones having a large triangular patch of bright blue towards their junction with the body ; the posterior margins of both wings are of a pale fawn colour, and fringed ; the lower wings have small caudate wings ; the under surface is of an ash colour, with three macular bands, and an eye-like spot of rich green near the lower angle of the under wings ; the body is bright yellow beneath.

The female has no patch of blue on her upper wings, and differs, in the colour being more inclined to purple, than it is in the male.

The larva is very fat, of a beautiful rosy colour, with a yellow stripe along its sides, and in the middle of each annulation is a minute round dot of green ; the lower surface is also yellow. It feeds on the oak, and is to be found in the caterpillar state in June. The chrysalis is glossy, of a ferruginous colour, with three dorsal lines of brown dots ; it changes to the perfect butterfly condition in July.

THE BLACK AND GOLD BUTTERFLY.

Papilio Helena.

PLATE XXXVII.

Papilio Helena, *Linn. Syst. Nat.* p. 748.—*Cramer's Desc. de Papillons*, pl. 22. f. 1.—*Shaw's Nat. Miscellany*, pl. 77.

ALL the wings of the *Helena* are black, with alternate radiations, rendered visible by the play of light; the upper wings are very slightly indented, and the lower ones considerably so, with a large patch of bright golden yellow on each; the body is light burnt umber brown; the antennæ are rather short and slender, with pretty large knobs at their tips.

The *Papilio Helena* is a South American insect, and principally found in Surinam. It is considered as one of the most striking of the exotic butterflies, and is distinguished by the deep velvet black of its wings, which are marked by a few lighter stripes, accompanying the fibres; while the lower wings are ornamented by a very large spot or patch of the richest golden yellow, traversed by several veins of black.



37.

THE BLACK AND GOLD BUTTERFLY.

Papilio Helena.—SURINAM.



38.

THE CÆRULEAN BUTTERFLY.

Papilio Cærulea—*Female*.—BRITAIN.

THE CÆRULEAN BUTTERFLY.

Papilio Cærulea.

PLATE XXXVIII.

Papilio Argus, *Harris' Aurelian*, p. 75, pl. 39, fig. i.—*Linn. Syst. Nat.* p. 789.—*Polyommatus Argus*, *Latreille*.

THE wings of the Cærulean Butterfly are of a deep azure blue, as also the body ; the under wings have a very broad band of dull crimson at their lower margin, which reaches nearly to their centre ; this band is spotted with circular and triangular black dots ; the whole posterior margins of both wings are surrounded by a white edge.

The female differs considerably from the male, the upper side being of a dark brown colour.

The under side of the wings are handsomely bordered with eye-like spots ; the other parts of the wings are of an ash colour, besprinkled all over with small ocellated spots, or circles.

This butterfly emerges from its chrysalis about the beginning of June. It is found in several parts of Britain, but not in great abundance.

THE APOLLO BUTTERFLY.

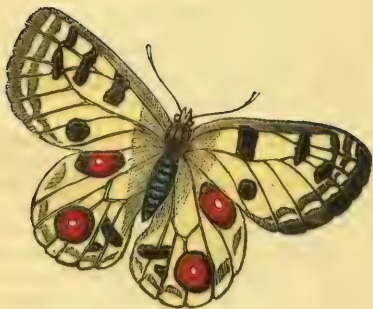
Papilio Apollo.

PLATE XXXIX.

Papilio Apollo, Linn. F. *Sæc.* 1032. — *Haworth's Lep. Brit.* i. p. 29.—*Donovan's Brit. Ins.* pl. 433.

THE wings are slightly indented, of a fine pale straw colour; the upper ones having large black spots, with a macular band of semilunate clusters of dots, which also extend over the under wings; the lower ones have four large annulets of bright scarlet, white in the centre, and surrounded by black, with a brown double lunated spot towards their inner margin; the body is black above, and brown beneath; the annulets are the same below as above; and there are a row of four large scarlet spots on each side of the body; and a double sesquialterous scarlet spot, with a white one in its centre.

The *Papilio Apollo* is the offspring of a solitary sluggish larva, of a black colour, covered with a soft silky down. All the wings are marked on both sides with two red spots, which together constitute a longitudinal series along each side. Besides these spots, every segment is marked nearer the middle of the back with three small lateral dots of a bluish colour, disposed in a semilunar manner, and thus forming



39.

THE APOLLO BUTTERFLY.
Papilio Apollo.—BRITAIN.

a longitudinal waved line on each side within the two rows of red spots. The anterior part of the head is furnished with tentacula, furcated when completely spread out, and which the animal can advance or retract at pleasure. The pupa is slightly folliculate, somewhat ovate, and of a bluish colour.

This large and beautiful butterfly is an inhabitant of various parts of Europe, and is found also in the more temperate parts of Siberia. It is inserted among the British Papilioncs, on the authority of Mr Haworth.

THE FORKED BUTTERFLY.

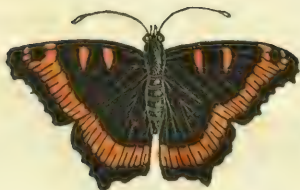
Papilio Furcillata.

PLATE XL.

Vanessa furcillata, *Say's American Entomology*, vol. ii.
pl. 27.

THE wings are angular, with a common fulvous band, and two fulvous spots on the superior ones ; beneath, brown, with black lineations. The superior wings are black above, with a broad fulvous sub-marginal band, which is bifid at the costal margin, having the exterior division terminated by a white spot, and the inner division by a pale yellow one ; between the band and the base of the wing are two fulvous transverse spots ; costal rib near the base with yellow variegations ; inferior wings black above, with a broad fulvous sub-marginal band, and on the black margin is a series of six or seven small sub-lunate purplish ophalescent spots ; all the wings beneath are blackish, and very numerous transverse blacker lineations, some of which are undulated, and deep velvet black ; a common pale brownish sub-marginal band, also with the blackish lineations ; the antennæ are yellow at the tip of the club ; venter, dull whitish.

This pretty species of butterfly was observed by



40.

THE FORKED BUTTERFLY.

Papilio Furcillata.—UNITED STATES.

Mr Say several times in the north-west territory, during the progress of the late expedition under the command of Major S. H. Long, over that region. In the vicinity of Fort William, an establishment of the Hudson Bay Fur Company, it frequently occurred in the month of September, whilst the party remained at that place. It is closely allied to the *Polychloras* and *Urtica* of Europe, but is sufficiently distinct from either.

The larvæ of the genus *Vanessa* live on plants of little altitude, and are often gregarious; they are armed with numerous, long, rigid, dentated spines, which, like the quills of the hedgehog, constitute their only defensive weapons. The chrysalids are attached to a fixed object by the tail, and in this reverse posture quietly wait the period of their final emancipation and perfection.

THE LARGE WHITE CABBAGE BUTTERFLY.

Papilio Brassicæ.

PLATE XLI.

Papilio Brassicæ, *Linn. Syst. Nat.* ii. p. 759, No. 75. *Dobson's Brit. Ins.* pl. 446.—*Pontia Brassicæ*, *Latreille*.

THE wings are rounded and entire, of a pale yellowish white; the posterior margins fringed; the upper wings have a large patch of black at their tips, and three large black spots, the higher ones being near the centre, and the other beneath; the lower wings have a single black spot in the centre of their anterior edge; the female marked with two black spots; the body is black above, and yellow underneath.

The larva is of an ashen-gray above, and cream colour beneath, with a central line of yellow down its back, the colour of its back and belly being divided by a yellow line; the head is black; the whole upper surface is thickly speckled with irregular punctated black dots.

In dry seasons, favourable to the growth and increase of these pernicious insects, the larvæ become very injurious to our gardens, and would be infinitely more so, were it not for the number of



41.

THE LARGE WHITE GARDEN BUTTERFLY.

Papilio Brassicae.—BRITAIN.



small birds which prey upon them, and thus lend their friendly aid to destroy these rapacious intruders. They feed, for the most part, on cabbages, and some other of our culinary plants, which renders them more injurious to the kitchen-garden than any other. We have seen a garden with many hundreds of cabbages completely devoured by these caterpillars. They are of the number of those known in England by the trivial name of grub, and in the perfect or winged state they are distinguished by the less ambiguous epithet of Large Cabbage Butterfly.

From the astonishing fecundity of these insects, it may be wondered that they do not, in the course of time, completely overspread the face of the earth, and totally consume every green plant. This would certainly be the case, if the Omnipotent had not put a check to their progress. There is a genus of little insects, called by naturalists the *Ichneumon*, which always oviposits within the body of other insects, or in their larva or pupa. Different species have assigned to them particular insects, and the parent *Ichneumon* will lay her eggs nowhere else; she searches for these caterpillars with unremitting assiduity, till she is successful. Within these caterpillars the eggs are deposited, and are hatched; there they continue during their larva state, preying upon the vitals of the animal; they pass to the pupa condition, and eventually emerge the perfect insects. Some idea may be formed of the

service rendered to mankind by these Ichneumons which prey upon noxious larva, from the fact, that out of thirty individuals of the common Cabbage Caterpillar which Reaumur put into a glass to feed, twenty-five were fatally pierced by the *Ichneumon globatus*, which had totally consumed their intestines.* I do not, however, give this as an average of the numbers destroyed by their means. The following interesting observations by the Rev. Mr Bree, which are of a recent date, may serve to show the more probable numbers which suffer by this means:—"Towards the end of June last,† I observed a brood of the caterpillars of *Pontia brassicæ*, amounting in number to twenty-four, feeding on the cabbages in my garden. I placed them in confinement; and, as they were nearly full grown, they soon commenced preparing for their transformations. By the first of July, nine out of the twenty-four had turned to the chrysalis state, and the remaining fifteen produced the silken clusters of pupæ of *Microgaster glomoratus*. I mention this circumstance, not at all under the idea of its being any thing new or extraordinary; for I am aware, on the contrary, that it is one of every-day occurrence, and my object is to arrest the attention to the enormous extent to which the destruction of *Pontia brassicæ* is effected by the *Microgaster*. Nine caterpillars only, out of the twenty-four,

* Reaumur, ii. p. 419.

† 1831.

came to maturity as butterflies ; the remaining fifteen (*i. e.* nearly two-thirds) were destroyed by the parasite. Now, if the present instance is to be taken as a fair average example of what usually occurs, (and I see no reason why it may not,) we should have had this season, were it not for the ravages committed by the *Microgaster*, almost two-thirds more of this already very abundant butterfly than we now have. In the course of a few seasons, supposing no other ‘ preventive check ’ to come into operation, the Cabbage Butterfly would increase in a kind of geometrical proportion ; our gardens would soon be absolutely devoured and laid waste by the caterpillars ; and it would scarcely be possible to walk abroad without being smothered by the winged insects. So greatly are we indebted to this apparently contemptible little parasite, (whose operations are unheeded by all but naturalists, and of whose very existence the generality are perhaps scarcely aware,) for keeping down the increase of an insect, which would otherwise become a serious and alarming evil.

“ I may observe, that, though the Cabbage Butterflies did not come forth from the chrysalis till July 18th to 20th, the silken pupæ of *Microgaster* produced swarms of the winged insects by the 12th, ready to go forth and commence their destructive operations on fresh broods of caterpillars.

“ The Cabbage Butterfly appeared to me to be

unusually abundant, between London and Dartford, the first week in August; I observed them even hovering about the stalls and green grocers' shops in the outskirts of London, attracted, no doubt, by the cabbages and other vegetables exposed for sale.

“ Subsequent observation induces me to believe, that I have by no means overrated the ravages of the *Microgaster*, but that what is stated above, may be considered as no more than an average example of its destructive powers. The chalk cliffs at Dover abound with the wild cabbage, (*Brassica oleracea*,) which, as might be expected, affords food to an immense number of the Cabbage Caterpillars; and, accordingly, the butterfly is exceedingly abundant in that neighbourhood. The latter end of September I saw many caterpillars creeping about the cliffs, and undergoing their transformations. I remarked, that those which were infected by the *Microgaster*, far exceeded in number those which would arrive at the chrysalis state. I have also had occasion to make the same remark at Matcham, in Surrey. I may add, that on the 25th of September, I observed at Dover many specimens of *Microgaster* in the winged state, adhering to the pupa, from which they appeared to have just emerged; and the same also at Matcham, on the 8th of October. The flies thus produced at this late season of the year, would, no doubt, attack the later broods of Cabbage Cater-

pillars, which are often to be met with so late as the end of October, or even in November. The large and continuous supply of this little parasite throughout the summer and autumn, so long as its services are required, is one of those wise and beneficent provisions, which cannot but excite our admiration." *

If we compare the myriads of caterpillars that often attack our cabbages and brocoli, with the small number, comparatively, of butterflies of this species that usually appear, we may conjecture that they are commonly destroyed in some such proportion,—a circumstance that will lead us thankfully to acknowledge the goodness of Providence, in providing such a check to prevent the total destruction of some of our most useful and esteemed culinary plants.

The larva of the Large Cabbage Butterfly appears in spring, and, indeed, throughout the greater part of the summer, as there are two or more broods every year.

The chrysalis is of a rich yellow, clouded with gray, and speckled with crimson dots.

The appearance of the Large Cabbage Butterfly on the wing, in a morning, is considered generally as an unerring prognostic that the weather will clear up, and the day eventually prove fine.

* Loudon's *Magazine of Natural History*, No. XXIII. for January 1832, page 107.

The caterpillars of the Cabbage Butterfly, like various other species, have a particular mode of climbing, which is either by a sort of ladder or single rope of their own construction. There are few persons who have lived in the country but must have noticed the larva of this insect climbing up a wall, or over the glass of a window. If this process is closely observed, on the square which the animal is traversing, it will be noticed, that the creature leaves a visible tract behind it, like a snail. If this is examined with a microscope, it will be seen that it consists of little silken threads, which it has spun in a zigzag direction, forming a rope-ladder, by which it ascends a surface it could not otherwise adhere to. The silk which comes from these spinners is a gummy fluid, which hardens in the air, so that they have no difficulty in making it stick to the glass.

Many caterpillars that feed upon trees, particularly the Geometers, have often occasion to descend from branch to branch, and sometimes to the ground—especially previous to their assuming the pupa condition. Had they to descend by the trunk, supposing them able to traverse with ease its rugged bark, what a circuitous route must they take before they accomplish their purpose! Providence, ever watchful over the welfare of the most insignificant of its creatures, has gifted them with the means of attaining these ends, without all this labour and

loss of time. From their own internal stores, they can let down a rope, and prolong it indefinitely, which will enable them to travel where they please. Shake the branches of an oak, or other tree, in summer, and its inhabitants of this description, whether they are reposing, moving, or feeding, will immediately cast themselves from the leaves on which they are stationed; and, however sudden the attack, they are nevertheless provided for it, and will all descend by means of the silken cord alluded to, and hang suspended in the air. Their name, Geometer, was given them because they seem to measure the surface they pass over, as they walk with a chain. If one is placed on the hand, it will be felt to draw a thread as it moves. When they move, their head is extended as far as they can reach with it; then, fastening their thread there, and bringing up the rest of their body, they take another step, never moving without leaving the clue behind them, the object of which, however, is neither to measure nor to mark its path that it may find it again, but thus, whenever the caterpillar falls, or would descend from a leaf, it has a cord always ready to support it in the air, by lengthening which, it can with ease reach the ground. Thus it can drop itself without danger from the summit of the most lofty trees, and ascend again by the same method. As the silky matter is fluid when it issues from the spinners, it should

seem as if the weight of the insect would be too great, and its descent too rapid, so as to cause it to fall with violence upon the earth. The little animal knows how to prevent such an accident, by descending gradually. It drops itself a foot, or half a foot, or less, at a time, then, making a longer or shorter pause, as best suits it, it reaches the ground at last without a shock. From hence it appears, that these larvæ have power to contract the orifice of the spinners, so that more of the silky gum shall issue from it, and to relax it again when they intend to resume their motion downwards ; consequently there must be a muscular apparatus to enable them to effect this, or at least a kind of sphincter, which, pressing the silk, can prevent its exit. From hence it also appears, that the gummy fluid which forms the thread must have gained a degree of consistence even before it leaves the spinner, since, as soon as it emerges, it can support the weight of the caterpillar. In ascending, the animal seizes the thread with its jaws, as high as it can reach it ; and then, elevating that part of the back that corresponds with the six perfect legs, till these legs become higher than the head, with one of the last pair it catches the thread, from this the other receives it, and so a step is gained ; and thus it proceeds till it has ascended to the point where it wishes to reach. At this time, if taken, it will be found to have a packet of thread, from which, however, it soon dis-

engages itself, between the two last pair of perfect legs.* To see hundreds of these little animals pendent at the same time from the boughs of a tree, suspended at different heights, some working their way downwards and some upwards, affords a very amusing spectacle. Sometimes, when the wind is high, they are blown to the distance of several yards from the tree, and yet maintain their threads unbroken.†

* REAUMUR, ii. p. 375.

† KIRBY and SPENCE, ii. p. 294.

THE APATURINA BUTTERFLY.

Papilio Apaturina.

PLATE XLII.

Aconthea Apaturina, *Horsfield's Descriptive Catalogue of Lepidopterous Insects, in the Museum of the East India Company*, part ii.—*Zoological Journal*, vol. v. p. 68, pl. iii. fig. 1 ; 1, A.

THE upper wings are velvet black, with a double row of white dots along their disk, and two sub-lunar white patches next the oval margin, which is sub-crenated ; within these are three white spots, with a sub-lunar patch below ; all these patches are half covered with pale smalt blue ; and a solitary blue spot near the anterior margin, and approaching the sesquiteritious margin. The lower wings are black, and sub-crenated, with a very broad band extending nearly half the length of the wing. About an eighth of an inch from the oval margin, is an articulate white band, with a macular band of black ; close to its side, the sesquiteritious margins are hirsute, of a pale umber colour ; body black ; antennæ long. When the wings are expanded, it is about two and a half inches broad.

The native place of this butterfly, as far as Dr Horsfield has ascertained, is the island of Java.



42.

THE APATURIN BUTTERFLY.

Papilio Apaturina.—JAVA.



43.

THE SILVER STRIPE BUTTERFLY.

Papilio Paphia.—BRITAIN.

THE SILVER-STRIPE BUTTERFLY.

Papilio Paphia.

PLATE XLIII.

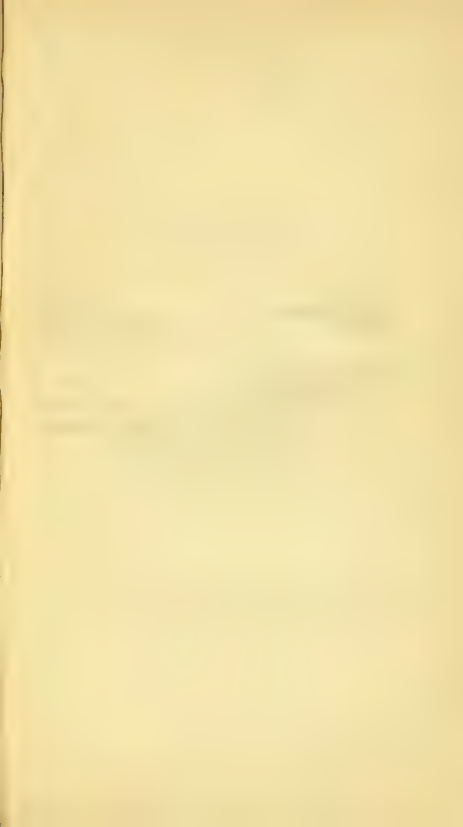
Papilio Paphia, Linn. *Syst. Nat.* ii. p. 786, No. 209.—*Wilk's Pap.* 57, 2, A. 7.—*Donovan's British Insects*.—*Argynnis Paphia*, Leach.

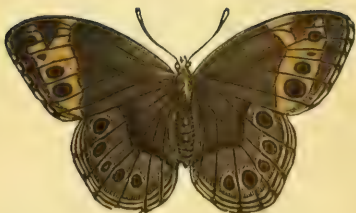
THE wings are two inches and two-thirds to three inches in extent; fulvous, or bright yellow, considerably indented on their posterior margin; the upper surface is elegantly spotted with black. The under side is striped with a silvery metallic lustre.

The *Papilio Paphia* is one of the most elegant of the British Papiliones. In size, colour, and general appearance of the upper side, it is very similar to *Papilio agala*; in the under side, it is extremely different. Both these butterflies are remarkable for that peculiar shining appearance of polished silver with which a few of the European Fritillary Butterflies are ornamented; but in *Papilio agala* this silver is disposed in distinct splashes, or spots; while in *Papilio paphia* it appears in transverse streaks. These streaks are finely softened into the red and olive green of the wings, and produce altogether a singular and charming effect. It was from

the latter circumstance that the early English collectors termed this the *Silver-washed* Fritillary.

The caterpillar of this butterfly is solitary, and is found on the grass in May. It feeds on the dog's violet, raspberry, and nettle. It is of a plain yellowish brown, with several longitudinal stripes of dark brown; it is also thickly beset with barbed spines, a quarter of an inch in length; and has, in particular, two of a remarkable form on the first annulation next the head. The chrysalis is grayish, with yellow points, and it remains in this condition twenty or twenty-one days, and appears in the winged state early in June. It is rather an uncommon butterfly; and chiefly inhabits Suffolk, Essex, Kent, Devon, Berks, and Penge Common.





44.

THE ANDROMACHA BUTTERFLY.

Papilio Andromacha.—UNITED STATES.

THE ANDROMACHA BUTTERFLY.

Papilio Andromacha.

PLATE XLIV.

Papilio Andromacha, *Linn.*—*Maniola Andromacha*, *Schrank.*
 —*Satyrus Andromacha*, *Latreille.* — *Hipparchia Andromacha*, *Fabricius and Say.*—*Oreas Marmorea Andromacha*,
Hubner.

THE wings are brown, with sub-marginal blackish spots; beneath, paler sub-perlaceous, with a series of ocellate spots; the body above and the superior surface of the wings are brown; the anterior wings beyond the middle, with a broad paler band, bifid below, and including a series of four fuscous oval spots, or epupillate ocellæ, of which the second, and sometimes the third, are small, and the posterior one largest; between the band and the exterior edge is a single narrow pale line, sometimes obsolete; exterior edge, alternately white and black; the posterior wings with a narrow, fuscous angulated line across the middle, in which is a series of fine fuscous epupillate ocellæ, with a yellow iris, the third smallest, then the fifth, and the first largest; exterior margin slightly tinged with rufous, and with one or two fuscous lines; beneath it is perlacous, with a brown narrow band before the

middle, and another rather beyond the middle ; beyond which is a broad lighter perlaceous band, in which, on the superior wings, are four epupillate ocellæ, the two or three anterior ones small ; and on the inferior wings are six ocellate spots, consisting of a fuscous spot surrounded by a yellow line, and having a white pupil ; first spot distant ; third small ; fifth double ; exterior margin with a yellow line.

This *Papilio* frequents Arkansaw, in the United States ; and it seems probable that it also inhabits the southern Atlantic States, as Hubner has given a plate of the insect. It has not been found so far north as Pennsylvania.

The caterpillar of the Andromacha Butterfly is downy and bimucronate behind ; the pupa undergoes its transformations suspended by the tail ; it is angulated, and bimucronated on the front.





45.

THE NICIPPE BUTTERFLY.

Papilio Nicippe.—UNITED STATES.

THE NICIPPE BUTTERFLY.

Papilio Nicippe.

PLATE XLV.

Papilio Nicippe, *Cramer*, table 210, fig. c. d.—*Herbat. Nat. Ins.* part v. p. 176, pl. 107, fig. 3, 4.—*Pieris Nicippe*, *Schrank and Say*, vol. ii. pl. 30.—It is the *Colias* and *Pontia* of *Fabricius*, and *Gonepteryx* of *Leach*.

THE wings are slightly crenate, fulvous, and the terminal margin black brown; upper pair of wings with a black abbreviated line above the middle, on each pair; the inferior pair with abbreviated ferruginous lines and spots.

The black terminal margins of the upper wings extend along the costal margin, nearly to the middle; the black transverse line on this pair of wings is very short, and consists of two curvatures; this curvilinear line appears also on the inferior surface, which is yellow, very slightly tinged with fulvous on the disk, with a blackish point at each indentation of the edge, and an oval, bright, fulvous spot near the base; the black terminal margin of the inferior wings has a prominent undulation in the middle; the inferior surface of this pair of wings is yellow, marked by numerous brownish, or ferruginous, abbreviated, transverse lines; a minute black point in the centre of the wings, and two or three more obvious, irregular, undulated, ferruginous, oblique lines; head

and thorax above, blackish ; antennæ beneath, white, with black incisures ; the feet are whitish ; the abdomen is black, each side furnished with a yellow line ; the venter with yellow incisures.

This insect is said by Cramer to inhabit Virginia, in the United States ; but it is also found in Pennsylvania, and in all the southern states. It is subject to some little variations ; the fine fulvous spot near the base of the inferior surface of the upper wings is sometimes white ; and the oblique lines under the inferior wings differ considerably in width and distinctness.

Schrank restricts the generic character of *Pieris* as follows :—“ The feet are nearly equal ; the nails of the tarsi, very apparent, bifid, or unidentate ; the inferior wings dilated beneath the abdomen, so as to form a groove.

These butterflies are natives of various regions of the globe ; some of them are very frequent in almost every field, and must have been noticed by the most casual observer, flitting, in a devious direction, over the herbage ; and, on meeting with a companion, mounting aloft in the air, with a hurried and irregular movement. Some species occasionally alight, in great numbers, on moist places on roads.

The caterpillar is destitute of the retractile tentacula of the neck ; and the chrysalis is of an angulated form, attached to a fixed object by a thread passed around the body, the head being upwards.



46.

THE RADIATED BUTTERFLY.

Papilio Ulysses.—ASIA.

THE RADIATED BUTTERFLY.

Papilio Ulysses.

PLATE XLVI.

Papilio Ulysses, *Linn. Syst. Nat.* p. 748.—*Fabr. Spec. Ins.* ii. p. 13.—*Cramer, Desc. de. Papillons*, ii. pl. 121.
—*Shaw's Nat. Misc.* pl. 92.

BOTH the upper and under wings of this insect are black; from the body, extending over three-fourths of the wings, it is of a fine verdigris green, radiating towards the posterior margins; the upper wings are entire, and the under wings deeply indented, with a margin of white semilunar spots, and a large caudate wing at the lower extremity of each wing. The body is black, changing into green with iridescent radiance; the lower surface of the wings has seven ocellated spots. The antennæ are short in proportion to the size of the insect, which measures five inches and a half in breadth.

This insect is of uncommon beauty. The wings are of the deepest velvet black; while the area, or middle part of each, is occupied by a very large proportion of the most brilliant and iridescent blue, which terminates in a radiated manner round the edges. This insect also affords an excellent example

of the *caudated Papilios*, in which the lower wings are furnished with a pair of appendages resembling tails. The ground colour in some specimens is rather brown than black. The under surface is black, tinged with rufous, large near the tips ; and the edges of the lower pair are ornamented by a series of ocellated spots, of a reddish colour, tinged with blue, and edged with black and white. It is an Asiatic insect.





47.

THE SMALL COPPER BUTTERFLY.
Papilio Virgaureæ.—BRITAIN.

THE SMALL COPPER BUTTERFLY.

Papilio Virgaureæ.

PLATE XLVII.

Papilio Virgaureæ, *Linn. Syst. Nat.* p. 793, No. 253.—
Donovan's Br. Ins. pl. 172.

THE wings are angulated, the upper side of a fine brown, or red copper colour, with a black margin; under side light brown, with several white spots, some having a black spot near the centre.

A specimen of this rare insect has been taken at Cambridge. It has always had a place in the cabinets of the principal English collectors; but we cannot learn by whom it was first discovered in this country. This and the *Hippothæ* have been frequently confounded with each other; but, on comparison, a material difference will be discovered.

Harris has made one error, which is of importance to the English collector to correct; he says, “the *Papilio virgaureæ*, copper, feeds on grass, found in June and August in meadows; is shining copper, spotted with black.” From this it appears he could mean no other than the common Copper Butterfly, which is found in June and August in meadows.

THE STATIRIAN BUTTERFLY.

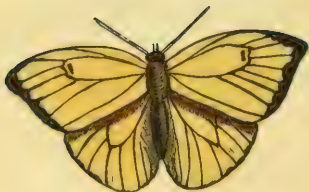
Papilio Statira.

PLATE XLVIII.

Papilio Statira, *Cramer, Desc. de Papillons*, pl. 120, fig. c. d.—*Colias Statira*, *Swainson's Zool. Illus.*

THE wings are diluted yellow, or fulvous ; the anterior with a black border and central dot, which, beneath, is ferruginous ; posterior beneath, each with two unequal snowy spots ; palpi lengthened.

Swainson says this insect is only to be found in Brasil ; and thinks that Godart and Latreille have erroneously considered it as a variety of *Colias juguthina*, which he considers as a native of India only.



48.

THE STATIRIAN BUTTERFLY.
Papilio Statira—BRASIL.



49.

THE LICARSIS BUTTERFLY.
Papilio Licarsis.—SURINAM.

THE LICARSIS BUTTERFLY.

Papilio Licarsis.

PLATE XLIX.

Papilio Licarsis, *Cramer, Desc. de Papillons*, pl. 63, fig. c.

THIS remarkable butterfly is black; the upper wings have two sesquialterous light blue bands, continued through the under wings,—which are much elongated, with very long caudate wings; about the centre of the anterior margins of which they are deeply indented; there are two transverse light blue spots a little way above the caudate wings; and near the middle, at the inner margin, are similar spots of scarlet, and also one on each side of the anterior margins of the upper wings, close to the body; antennæ, short and erect; along the posterior margins of the caudate wings, are narrow bands of white; body, very short.

This very uncommon butterfly is a native of Surinam, and is, perhaps, one of the most curiously formed of the papilionaceous tribe.

THE HELENUS BUTTERFLY.

Papilio Helenus.

PLATE L.

Papilio Helenus, *Linn. Syst. Nat.* ii. p. 745, No. 4.—
Cramer, Desc. de Pap. ii. p. 90, pl. 153, fig. A. B.

THE upper wings are black, and entire ; the lower ones also black, and scalloped, with black caudate wings ; round the posterior margin of the lower wings are semilunate white spots ; in the centre of the wings are large spots of straw yellow, and at the lower inner margins are two semilunate spots of scarlet on each wing. The body is of a deep blackish brown.

This curious butterfly inhabits India and China, and is said to be found in the island of Amboyna.



50.

THE HELENUS BUTTERFLY.
Papilio Helenus.—INDIA.



51

THE PHLEGIA BUTTERFLY,
Papilio Phlegia.—SURINAM.

THE PHLEGIA BUTTERFLY.

Papilio Phlegia.

PLATE LI.

Papilio Phlegia, *Seba*, iv. tab. 34, fig. 7, 8.—*Cramer*, *Desc. de Pap.* iii. p. 9, pl. 197, fig. F.

THE upper and under sides of this pretty butterfly are black, as well as the body, with a wedge-shaped transverse patch of reddish orange extending from the body half across the upper wings, and a small one, the same shape and colour, on the under wings. The back has five spots of the same colour, and the segments of the body on each side are spotted with this colour; eyes scarlet, with a spot of the same colour below their outer upper surface. All the other parts of both wings are spotted with white; those on the upper wings are irregular in the centre, and forming a double row near the margins; the under wings are radiated.

The male differs from the female in having the black borders of the upper wings crossed by two narrow transverse bands of a reddish brown colour.

This interesting species is a native of Surinam, where it is said to be rather rare.

THE HELIUS BUTTERFLY.

Papilio Helius.

PLATE LII.

Papilio Helius, *Cramer*, *Desc. de Pap.* iii. p. 10, pl. 198,
fig. 13.

THE wings are entire, and black, as well as the body; the lower ones have very large patches of scarlet on each; the body is bluish black; the eyes are scarlet; and the antennæ short and erect. The under surface of the wings is black, and iridescent green. The abdomen is marked with yellow rings beneath. It is a native of the West Indies.

This *Papilio*, although small, is nevertheless very pretty, from the strong contrast of colour which it exhibits.



52.

THE HELIUS BUTTERFLY.
Papilio Helius.—EAST INDIES.





53.

THE ALMATHE BUTTERFLY.

Papilio Almathea.—SURINAM.

THE AMALTHEA BUTTERFLY.

Papilio Amalthea.

PLATE LIII.

Papilio Amalthea, *Linn. Syst. Nat.* ii. p. 779, No. 174.—
Cramer, Desc. de Papillons, iii. p. 29, pl. 209, fig. A. B.

THE upper wings are entire, and the under ones indented at their posterior edges, with sub-caudate wings, curiously directed obliquely outwards at their points. The insect is black ; within the whole posterior margin there is a double row of white spots, with eight other irregularly placed white spots on both wings ; a sesquialterous divided band of deep crimson passes over the middle of both upper and under wings, with several spots of the same colour on the upper wings. The body is dark reddish brown, the whole of which is surrounded by a broad band of the same colour, extending from the anterior margin of the upper wings, to the lower inner angle of the under ones ; a transverse narrow band of the same colour runs from the body halfway along the exterior margin ; the eyes are scarlet ; and the antennæ short.

The general aspect of this *Papilio* is rather uncommon. It inhabits Surinam, and was first figured by Madam Merian.

THE EUTREPE BUTTERFLY.

Papilio Eutrepe.

PLATE LIV.

Papilio Eutrepe, *Cramer, Desc. de Papillons*, iii. p. 89,
pl. 246, fig. D.

BOTH the upper and under wings and body of this species are black; they have an articulate band of rich fawn colour, with which, in all the wings, are a number of oblong oval and lineated spots of a bluish-white colour, very transparent; a row of similar spots is disposed along the centre of the back, one on each segment; on the upper part of the body are four white and two fawn coloured spots, with a white one on the centre of the head.

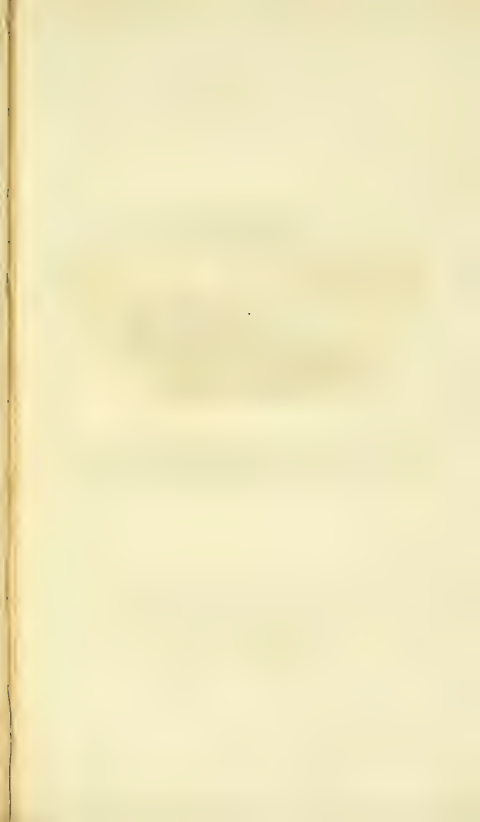
The under surface of the wings in all respects resembles the upper side, but the under part of the body is white.

This *Papilio* is a native of Surinam.



54.

THE EUTREPE BUTTERFLY.
Papilio Eutrepes.—SURINAM.





55.

THE SYNCELLUS BUTTERFLY.
Papilio Syncellus.—SURINAM.

THE SYNCELLUS BUTTERFLY.

Papilio Syncellus.

PLATE LV.

Papilio Syncellus, Cramer, *Desc. de Papillons*, iv. p. 86,
pl. 334, fig. A. B.

THE superior surface of the wings is of a rich verdigris blue, of fine satiny lustre, and thickly set with black bands ; the posterior margins are black, in the middle of which is an interrupted row of high-toned fawn coloured spots ; segments of the body fawn colour ; back blue, the same as the wings ; the eyes are of a bright scarlet, and the antennæ short and straight.

The Syncellus Butterfly is one of the rare insects of Surinam.

THE CHARLOTTE BUTTERFLY.

Papilio Charlotta.

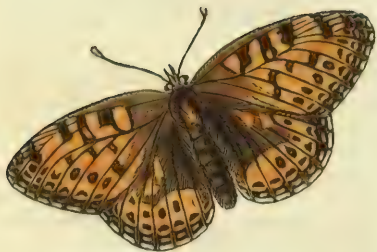
PLATE LVI.

Papilio Charlotta, *Leach's Zool. Miscel.* p. 23, pl. 11.

THE upper surface of the wings is of a rich fawn colour, covered with various patches of dark brown; the exterior margin has a scalloped band of the same colour, with a row of longitudinal dots in its centre, and a macular fascia inside of it; body same colour as the wings; under surface of the upper wings nearly the same colour as the upper surface, fading into a sulphur yellow towards their acute angle, with a macular band of silver spots. Under wings beneath sulphur yellow, with macular bands of silver; body covered with a thick coat of subulated hairs; the antennæ rather long, with lengthened knobs on their extremities.

This curious and pretty Fritillary was discovered by the Rev. Dr Charles Abbot, in Bedfordshire, and was named by Dr Leach, who first figured it in honour of the late Princess Charlotte.

The *Papilio Charlotta* stands next to the *Papilio Aglaia* in the Linnæan system.



56.

THE CHARLOTTE BUTTERFLY.
Papilio Charlotta.—BRITAIN.





57.

THE LUDOVICA BUTTERFLY.
Papilio Ludovica.—SURINAM.

THE LUDOVICA BUTTERFLY.

Papilio Ludovica.

PLATE LVII.

Papilio Ludovica, Cramer, *Desc. de Papillons*, iv. p. 17,
pl. 297, fig. E.

THE external sides of the upper wings of this insect are black, with various small patches of fine yellow ; and a large band of the same colour bounds the black, within which, and extending over the body and lower wings, is a fine chestnut colour ; the lower wings have a marginal band of black, with a row of white dots in the middle, which are continuous in the upper wings ; the upper part of the back has four small round dots of white ; the eyes are scarlet ; and the antennæ long and slender. The under surface of the wings corresponds in every respect with the upper surface.

This is one of that tribe which is so remarkable for its oblong transverse shape ; the body is also singularly formed, being excessively small at the commencement of the segments, and gradually bulging till about the middle one, from whence it abruptly tapers to the tail, which is short.

It is a native of Surinam.

THE BELISE BUTTERFLY.

Papilio Belise.

PLATE LVIII.

Papilio Belise, *Cramer Desc. de Papillons.* iv. p. 171,
pl. 376, fig. E. F.

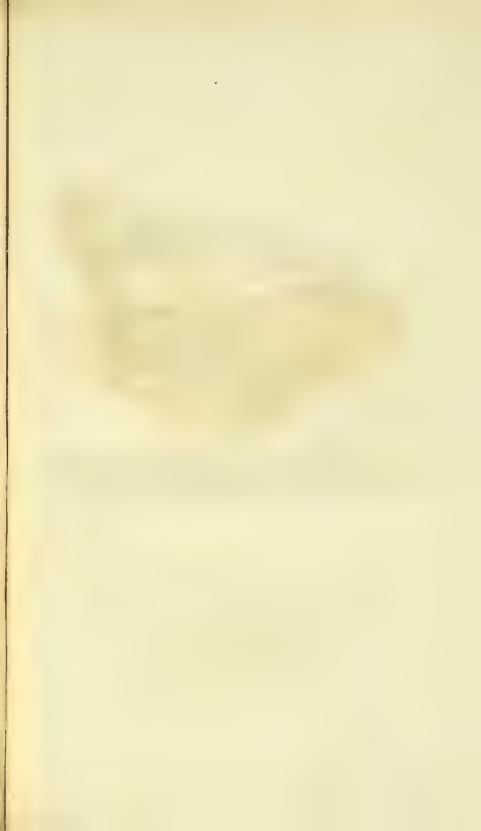
The upper wings are black, with an oblong spot of white towards their posterior margin, and two small spots near the lower angle of the wings. There is a large crescent-shaped white band, which occupies nearly the whole under wings; the discs terminate about the centre of the upper wings; this is surrounded with a broad edge of beautiful clear light blue, near the lower margin of which is a transverse fillet of black, and the lower posterior margin of the under wings is bounded by a white band. The body is dark brown, and the eyes scarlet.

This very pretty insect is a native of Surinam.



58.

THE BELISE BUTTERFLY.
Papilio Belise.—SURINAM.





59.

THE CLEONA BUTTERFLY.
Papilio Cleona.—AMBOYNA.

THE CLEONA BUTTERFLY.

Papilio Cleona.

PLATE LIX.

Papilio Cleona, *Cramer, Desc. de Papillons*, iv. p. 178,
pl. 377, fig. F.

THE wings and body of this handsome *Papilio* are black, with large, variously shaped spots of yellowish green, and three umber-coloured spots towards the lower edge of the under wings; the whole posterior margins of the wings are surrounded by a double row of white dots.

At the extremity of the abdomen are two tufts of hair shaped like brushes, which seem peculiar to some butterflies, but are of rather rare occurrence. The back has six white dots.

The *Cleona* Butterfly inhabits Amboyna, and may be ranked among the rarities of the native Butterflies of that island.

THE RICINI BUTTERFLY.

Papilio Ricine.

PLATE LX.

Papilio Helicon, *Linn. Syst. Nat.* ii. p. 756, No. 63.—
Papilio Ricine, *Cramer, Desc. de Papillons*, iv. 174, pl. 378, fig. A. B.

THE upper and under wings and body of this insect are black; the upper wings entire, and the under ones slightly scalloped. In the centre of the upper wings are large oblong upright spots of rich yellow, and smaller ones of the same colour towards the extremity; the interior margin is of a beautiful crimson colour, extending over half of the lower wings; on the back there are two yellow dots behind the head, with a horseshoe-shaped mark beneath them, below which are four small dots of the same colour; the segments of the body are spotted with yellow on each side. The eyes are scarlet.

This insect inhabits America: the caterpillar feeds upon the *Ricinus palma christi*. The anterior pair of feet are short, as is the case with all those butterflies with oblong wings, which foreign naturalists distinguish by the name of *narses*.



60.

THE RICINI BUTTERFLY.
Papilio Ricine.—AMERICA.



WE close our description of these sparkling, but short-lived beings of the sunbeams, with the following beautiful verses from the pen of Mrs Hemans:—

TO A BUTTERFLY NEAR A TOMB.

BY MRS HEMANS.

I stood where the lip of Song lay low,
Where the dust was heavy on Beauty's brow ;
Where stillness hung on the heart of Love,
And a marble weeper kept watch above ;

I stood in the silence of lonely thought,
While Song and Love in my own soul wrought ;
Though each unwhisper'd, each dimm'd with fear,
Each but a banish'd spirit here.

Then didst *thou* pass me in radiance by,
Child of the Sunshine, young Butterfly !
Thou that dost bear, on thy fairy wing,
No burden of inborn suffering.

Thou wert flitting past that solemn tomb,
Over a bright world of joy and bloom ;
And strangely I felt, as I saw thee shine,
The all that sever'd *thy* life and mine.

Mine, with its hidden mysterious things
Of Love and Grief, its unsounded springs,
And quick thoughts, wandering o'er earth and sky,
With voices to question Eternity !

Thine, on its reckless and glancing way,
 Like an embodied breeze at play !
 Child of the Sunshine, thou wing'd and free,
 One moment—*one* moment—I envied thee.

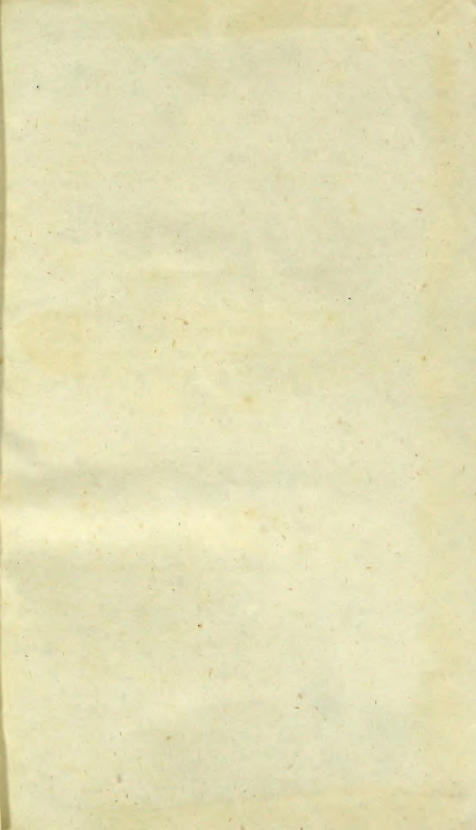
Thou art not lonely, though born to roam,
 Thou hast no longings that pine for home ;
 Thou seek'st not the haunts of the bee and bird.
 To fly from the sickness of Hope deferr'd.

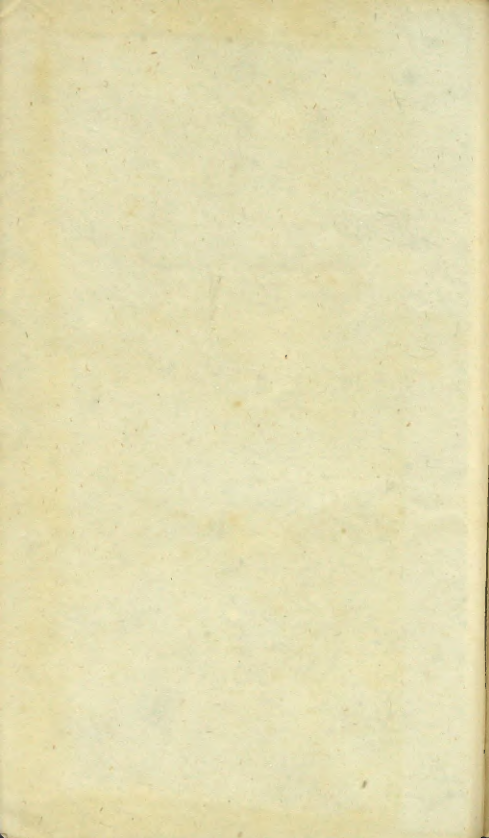
In thy brief being no strife of mind,
 No boundless passion is deeply shined ;
 But I—as I gazed on thy swift flight by,
 One hour of *my* soul seem'd infinity !

Yet, ere I turn'd from that silent place,
 Or ceased from watching thy joyous race,
 Thou, even *thou*, on those airy wings,
 Didst waft me visions of brighter things !

Thou that dost image the free soul's birth,
 And its flight away o'er the mists of earth,
 Oh ! fitly *thou* shinest mid flowers that rise
 Round the dark chamber where Genius lies.

END OF VOLUME FIRST.





MAY -- 1987

